

Sanitary Survey Report

**Polacca, Arizona
PWSID #0400106**

Survey Conducted on April 7, 2014

**Survey Conducted for the
Environmental Protection Agency
Region 9**

**Sanitary Survey Conducted by
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For

**Bessie Lee, U.S. EPA Region 9
EPA Program Manager**

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I. Narrative Report

**Sanitary Survey
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A. Introduction

On April 7, 2014, Dan Fraser, P.E., and JanDee May, of Sleeping Giant Environmental Consultants, LLP (SGEC), conducted a sanitary survey of the Polacca Public Water System (PWS). SGEC is an independent contractor that performs sanitary surveys for the U.S. Environmental Protection Agency's Region 9 (USEPA Region 9). SGEC was assisted during the sanitary survey by:

- Ivan Sidney, Business Manager, First Mesa Consolidated Villages (FMCV)
- Alfonso Sekeva Jr., Primary Water Operator, FMCV
- Wally Youvella, Back-Up Operator, FMCV
- Sharon Grover, Receptionist, FMCV
- Gail Poley, Community Service Administrator, Walpi Village
- Bessie Lee, EPA Program Manager, United States Environmental Protection Agency, Region 9 (EPA Region 9)
- Christopher "Kiffer" Green, Tribal Utility Consultant, Indian Health Service (IHS)
- Peter Mitchell, Engineer, IHS

After the sanitary survey, Peter Mitchell provided additional information on the PWS electronically.

B. Description of the System

The Polacca PWS is owned by the FMCV and serves the villages of Walpi, Sichomovi and Tewa which make up the community of Polacca. Ivan Sidney is the business manager for the FMCV and oversees the operation and maintenance of the PWS. Ivan Sidney answers to the Tribal Board. Alfonso Sekeva Jr. is the primary water operator and Wally Youvella assists Alfonso when needed

The PWS serves residences, government offices, churches, businesses, the Hopi Health Care Center, First Mesa Elementary School and government housing. Based on billing information provided by the PWS, there are 478 documented residential and 19 non-residential connections. Additionally, as many as 30 homes may be illegally connected for a total of 517 residential connections. FMCV estimates that approximately 5 persons are served by each residential connection for a total residential population of 2,540 persons. An estimated 10 of the 19 non-residential connections serve transient users. With the addition of non-residential transient and

non-transient users, the total estimated population served by the PWS is 2,600 persons. Because of the number of residential users, the PWS is classified as a community system public water system. As a community PWS, it is regulated for contaminants that can cause harmful health effects when consumed over both the short-term and long-term.

The PWS facilities include three ground water wells (one of which has been out of service for years), two treatment plants, three welded steel storage tanks, two booster pumping stations and a distribution system with three hydraulically separate components. The two active wells pump into the distribution system from opposite sides of the PWS (southwest and northeast). One of the ground level welded steel storage tanks floats on the line and two are in-line configurations with dedicated transmission mains.

One of the booster pumping stations takes suction from the distribution system and lifts water through a galvanized iron pipe (GIP) to be stored in an 8,000-gallon welded steel tank on the upper mesa. From there, the second booster pumping station pressurizes the mesa's distribution system.

The following narrative contains a more detailed description of the water system's facilities. Deficiencies and recommendations are numbered in order of their priority at the end of the report. Detailed information on facility design and construction, and inspection observations are documented in the sanitary survey form and schematics in Section II. All referenced photos are contained in Section III of this report.

C. The Basis and Purpose of Sanitary Surveys

The sanitary survey site visit was conducted by SGENC on behalf of the U.S. Environmental Protection Agency (EPA) Region 9. EPA Region 9 implements the Safe Drinking Water Act (SDWA) and regulations regarding public water systems contained in 40 CFR Part 141 – National Primary Drinking Water Regulations as they apply to most of the PWSs on Tribal lands in Region 9. Regular sanitary surveys of PWSs are an important component of EPA Region 9's implementation program and are critical for protecting the health of PWS water users.

Sanitary surveys are comprehensive evaluations of a PWS's physical components as well as management and operation. Sanitary surveys have an on-site component in which above-ground facilities are inspected, records are obtained and reviewed, and operators and managers are interviewed. PWS components evaluated typically include:

1. source(s)
2. treatment
3. storage
4. pumping facilities
5. operator compliance with training and certification requirements

6. management and operations
7. distribution system (including cross connection control)
8. monitoring, reporting and data verification

The sanitary survey determines if adequate barriers are in place to protect consumers from waterborne pathogens and other contaminants. Over the past century and a half, water systems, engineers, scientists and regulators have developed practices that have become known as the “multiple-barrier approach” to public health protection. This approach essentially places barriers between potential contaminants, such as pathogenic organisms, and water users. In theory, and in practice, each barrier reduces the health risk to consumers. Also, putting more barriers in place lessens the detrimental impact of the failure of any single barrier and the statistical likelihood of the total failure of all barriers. Examples of barriers that are typically used by PWSs include:

- selection of high quality sources of water
- protection of water sources
- provision of appropriate treatment, which often includes multiple barriers that act to remove and/or inactivate contaminants
- storage of treated water in well-designed, covered reservoirs that are protected from contamination
- distribution of water, under positive pressure, in a properly designed network of pipes designed to prevent entry of contaminants
- preventive and corrective maintenance of facilities including:
 - establishment of an operation and maintenance manual
 - establishment of standard operating procedures for critical activities
 - flushing mains
 - flow-testing hydrants
 - exercising valves to ensure their locations are known and they are functional
 - inspection, cleaning and rehabilitation of storage tanks
 - pump and control repair and replacement
- monitoring and testing of the water
- ensuring compliance with regulations
- implementation of a cross-connection control program that includes annual testing of assemblies
- adoption of minimum design standards for physical facilities

- effective and competent operation, maintenance and management of the PWS

The Ground Water Rule (GWR) requires primacy agencies to conduct sanitary surveys for PWSs utilizing ground water. During the sanitary survey, the eight components listed above are evaluated to determine if appropriate barriers are in place for protection of the users' health. Where they are not, the risk to public health is assessed, deficiencies are found, and recommendations for correction are made. The sanitary deficiencies deemed to present the most serious risks to users will be identified as "significant deficiencies." A "significant deficiency" is defined in CFR Part 141.723(b) as a "defect in design, operation, or maintenance, or a failure or malfunction of the sources, treatment, storage, or distribution system the EPA determines to be causing, or has the potential for causing the introduction of contamination into the water delivered to consumers." Further, CFR Part 141.723(d) requires systems to correct significant deficiencies according to a schedule approved by the primacy agency.

D. Sources

The Polacca PWS has three ground water wells. Two of the wells, Well 5 and Well 6, are located to the west of Polacca and one, Well 8, is located to the east. Only two of the three wells are in service. Well 5 has been offline since 2006.

Well 6 (and Well 5, when online) pumps into the distribution system on the southwest side of the PWS. It fills ST002, which is located on the northwest side of the PWS. This well and storage tank serve all the west side of the PWS and everything south of HWY 264. On the northeast side of the PWS, Well 8 pumps directly to ST002 through a transmission main (TM001) and this combination of source and storage serves the balance of the PWS including the pumping facility that lifts water to the upper mesa. These two major components of the distribution system are referred to as DS001 (west side and south of HWY 264) and DS003 (east and central) in this sanitary survey report. They are physically connected but valved-off because ST002 is at a higher elevation than ST001. The distribution mains that serve the upper mesa are referred to as DS002.

All of the wells reportedly have arsenic above the maximum contaminant level of 10.0 micrograms per liter and no treatment is in place to remove arsenic; however, the system is working with EPA and IHS to replace their current wells with water to be provided by a proposed regional system that will include other Hopi villages over a 40-mile span. On at least one occasion, the two wells on the west side of the PWS were reported to be inundated with flood water caused by heavy rainfall.

The only information regarding the construction of wells and their water quality comes from materials that were provided during an earlier sanitary survey conducted by the Cadmus Group, Inc. Those records are not in the possession of SGEC; however, they were submitted to EPA Region 9 by the Cadmus Group and some of the data are included in this sanitary survey report.

GW002/West Well 6 – Photo 2: GW002 is located 75 yards northeast of the treatment plant (TP001). The well is the only active well on the west side of the PWS. The casing extends more than 18 inches above grade and has a sanitary seal. The sanitary seal is vented, gasketed but one bolt is missing and needs to be replaced. The electrical conduit has separated creating an opening that would allow insects and dust to enter the casing and contaminate the water. The well is not protected by a security fence and its sanitary seal has no locking device. IHS records show it was drilled to a depth of 915 feet but detailed construction records, including grouting, were not available for the surveyors.

The well's submersible pump produces about 130 gpm. It pumps the water through the treatment plant building where NSF-approved sodium hypochlorite solution is injected for disinfection. It is operated manually and the operator turns it on and off based on the water level in ST001.

GW003/West Well 5 – Photo 3: GW003 is located 85 yards southwest of the treatment plant (TP001). This well has been inactive since 2006. It reportedly produces water of better quality than that of GW002. Both wells appear to be completed in the same aquifer so it seems unlikely that the quality would differ a lot. The casing extends about 3 ½ feet above grade and has a sanitary seal. The sanitary seal appears to be missing its gaskets and there is a low area around the casing where water can pool and migrate down the casing. The well is designed to pump to TP001 where its water will combine with that of Well 6 and disinfection will occur. Information provided by the IHS indicates that the well has a 40-hp 150-gpm Grundfos submersible pump that was installed in 2012. Unfortunately, the well still is not functional and there seems to be some disagreement about what exactly the problem is.

The well is not surrounded by a security fence and its sanitary seal is not equipped with a locking device. A driller's log was not available for the well. IHS records indicate the well was drilled to a depth of 910 feet. Complete well construction details including grouting were not available to the surveyors.

GW004/East Well 8 – Photos 6-9: GW004 is located at the northeast part of the PWS. It is located a few yards outside the secured enclosure for its treatment plant (TP002). Its casing extends more than 18 inches above grade and is fitted with a properly vented sanitary seal. One of the sanitary seal's bolts is missing its nut which should be replaced. The well is not protected by a security fence and its sanitary seal does not have a locking device.

IHS records indicate the well was drilled to a depth of 1,120 feet. No other information was made available on the well's construction. The total dissolved solids in Well 8 have been measured at 380 mg/L.

The discharge from Well 8 was measured at 92 gpm. It pumps to a building where it is metered and NSF- approved sodium hypochlorite solution is injected for disinfection purposes. It is operated manually based on the water level in ST002.

E. Treatment

The system has two disinfection facilities. The older of the two is located on the southwest side of Polacca and provides disinfection for Well 5 and Well 6. It is a constant feed system so both wells should operate at the same time to ensure proper chlorine residuals. The newer treatment facility (TP002) is located beside Well 8 on the northeast side of the system.

TP001/Treatment Plant for Well 5 and Well 6 – Photos 3-5: TP001 is located within a locked cinder block building that is spotless inside. A locked chain link security fence protects the facilities. TP001 is designed to provide disinfection for Well 5 (GW003) and Well 6 (GW002) with NSF-approved sodium hypochlorite (Photo 5). However, since GW003 is inactive, water from GW002 enters the building where it is metered and disinfection occurs.

The treatment plant consists of an LMI positive displacement injection pump and a chlorine solution tank. The injection pump is sized to chlorinate the flows from both wells simultaneously; however, with GW003 out of service, the pump's speed is set at 20 percent and its stroke at 20 percent. These low settings are likely to be less accurate than higher settings would be. Also, the low frequency rate causes delayed and poor mixing of the chlorine.

All of the facilities are located in the same room and, thus, are subject to the corrosive effects of chlorine. The vat of sodium hypochlorite solution is not sealed with a vent to the outside of the building to reduce the corrosion.

TP002/Treatment Plant for Well 8 (TP002) – Photos 6 & 10-11: TP002 provides disinfection for Well 8 (GW004) with 12.5 percent NSF-approved sodium hypochlorite solution (Photo 10). The treatment plant consists of an LMI positive displacement injection pump and a chlorine solution tank. The pump's speed is set at 20 percent and its stroke at 12 percent. This causes problems like those discussed earlier regarding TP001. In this case, however, the water is reportedly pumped directly to ST002 where mixing will occur and contact time is provided. If there are services connected to the transmission main, the pump should be changed out for one with a smaller capacity. Alternatively, the 12.5 percent sodium hypochlorite solution could be diluted to a level that would allow the metering pump to be operated in its mid ranges.

F. Finished Water Storage

The PWS has three active storage tanks. Each is responsible for providing storage and maintaining the pressure of three hydraulically separate portions of the distribution system.

ST001/Older West Storage Tank – Photos 12-17: ST001 is a 200,000-gallon welded steel storage tank that was constructed in 1977. The full access ladder has a safety cage and a locked flat metal cover over the first seven feet. The rest of the ladder has a safety cage with safety railings at the top. The cage does not have a

locked cover at its base. The water level target works and its cable housing is protected against the entry of dust and insects. The vent is screened but the screen has openings too large to exclude insects (Photo 13). The hatch cover is hinged, overlapping and locked. It is equipped with the same gasket that needed to be replaced at the time of the last sanitary survey (Photo 14). The interior of the hatch is badly corroded as is the interior steel ladder (Photo 15). It is difficult to determine the extent of the tank's internal corrosion by viewing it from the open hatch. However, indications are that the tank should be taken offline and rehabilitated (Photo 16).

The overflow pipe terminates away from the storage tank with no splash pad (Photo 17). A flap gate covers the end of the overflow pipe and there is significant erosion which provides ample evidence that manual operation of the well is inappropriate.

ST001 is surrounded by a locked chain link security fence. The fence has a large hole making it easy for unauthorized access to the enclosure (Photo 17). The exterior of the tank is free of graffiti and appears to be in good condition. The tank was drained two years ago but it is not known if it was cleaned at that time.

ST002/Newer East Storage Tank – Photos 18-23: ST002 is a 500,000-gallon welded steel tank that was constructed in 1998 and is located in the northeast part of the PWS about halfway up the mesa. The tank sits on a metal ring foundation. The full access ladder has a locked flat metal cover over the first eight feet of the ladder. The rest of the ladder has a safety cage with safety railings at the top. There is no locked cover at the base of the cage. The water level target works and the cable housing is tight to keep insects and windblown dust from entering the stored water. The tank's vent is properly designed and screened and its hatches are overlapping, locked and equipped with gaskets but the gaskets are in need of replacement (Photos 19-20). The interior of the tank is beginning to show some corrosion (Photos 21-22).

The overflow pipe terminates away from the storage tank with no splash pad (Photo 23). Insect screen covers the end of the overflow pipe. There is significant erosion at the site of the overflow. ST001 has a locked chain link security fence with one low spot under the fence (Photo 18). The outside of the storage tank is free of graffiti and appears to be in good condition.

ST003/Upper Mesa Storage Tank – Photos 27-32: ST003 is an 8,000-gallon ground level storage tank located on the southeast side of the mesa. The tank receives water from a booster pumping facility (PF001) located near the FMCV offices. The booster pumping facility is operated with a timer so the tank often overflows and occasionally runs out of water.

The Upper Mesa Tank has not been cleaned for at least 15 years and is in poor condition. It shows corrosion at its bottom and top seams and is leaking from its base and at its inlet (Photo 32). It has an overlapping hatch and screened vent. The hatch is not gasketed and is wired in place on one side (Photo 29). The target doesn't appear to work and there are openings in the roof that will allow contaminants to enter the stored drinking water (Photos 30-31).

The tank is scheduled to be replaced as one component of a project planned for construction this summer.

G. Pumps, Pumping Facilities and Controls

PF001/Pumping Facility to Upper Mesa – Photos 24-26: PF001 is located about 60 yards from the post office and the FMCV offices. The facilities are within a locked cinder block building. The pumps take suction from the portion of distribution system served by GW004 and ST002 and referred to as DS003. The water is pumped to the 8,000-gallon Upper Mesa Tank (ST003). This pumping facility has two Baldor vertical turbine pumps that are designed to alternate as lead pump and lag pump. Each 10-horsepower (hp) pump is designed to produce 53 gpm against 482 feet of head but only one of the pumps has been operational for the past several years. The functional pump is controlled by a time clock currently set for six one-hour pump cycles per day. The timer cycles are adjusted during ceremonies and activities that affect usage. At the time of the sanitary survey, the pumping facility was operating and overflowing ST003.

PF002/Upper Mesa Pumping Facility - Photos 33 & 36: PF002 takes suction from the 8,000-gallon Upper Mesa Tank (ST003) and provides water to the distribution system for the homes on the mesa. The pumping station has two 5-hp, 72-gpm pumps. The pumps are operated by two pressure switches located on top of the air/water interface hydropneumatic tank.

HP001/Hydropneumatic Tank 1 – Photos 33-35 & 37: HP001 is a 1,000-gallon air/water interface hydropneumatic tank that operates in conjunction with PF002. It serves to control the number of times the pumps cycle and the length of time the pumps run during each cycle. In so doing, it protects the pumps from damage caused by starting and stopping too frequently and short run times. During the survey, the pumping facility ran several times with each run time lasting only about one minute and 40 seconds. Assuming the pump is producing an average of 72 gpm, these run times indicated an active storage volume of 120 gallons or about 12 percent of the tank's volume. This seems low and the pump's run time is shorter than ideal for many 5-hp pumps. The tank has a sight gauge which shows it to be roughly $\frac{1}{2}$ full of air. The water level in the tank varies only a few inches from the pump-on point to the pump-off point. It is likely that the system is not set up for optimal operation.

The tank has a 1/6-hp compressor to prevent water-logging and maintain the air of the tank within preset levels. A pressure relief valve prevents the tank from reaching dangerous pressure levels.

Well, Treatment Plant and PF001 Controls: As discussed above, the well pumping and treatment systems are designed to be controlled by radio telemetry. Pressure transducers located at ST001 and ST002 should send signals to GW002 and GW003, and GW004 respectively to start the submersible pumps and treatment plants. Similarly, PF001 is designed to be controlled by radio telemetry with a

pressure transducer starting and stopping the pumps based on the water level in ST003. The automation for these facilities has not been functional for years so they are controlled manually and with time clocks. This results in inefficient use of water, operator time and electricity. It also leads to erosion and environmental damage at the tank overflow sites (Photos 17 & 23).

H. Monitoring, Reporting and Data Verification

The system collects four coliform samples per month. The four samples are collected from the distribution system which is divided into four quadrants (the mesa, east, west and central). The free chlorine residual is measured at the same time and place that the coliform samples are collected. A copy of the coliform sampling plan was requested but not provided to SGEC.

Disinfection byproduct sampling is conducted at three-year intervals. Alfonso is relatively new to his position as water operator and is not certain how many samples are required or where they should be collected.

I. Distribution System

The Polacca Distribution System (DS001, DS002 & DS003): Reportedly, a large portion of the distribution system has been upgraded with 6-inch, 8-inch and 10-inch diameter AWWA C-900 polyvinyl chloride (PVC) water mains. The IHS has prepared as-built drawings of the distribution system and provided them to SGEC electronically. The drawings confirm that most of the distribution system is comprised of PVC. The system also has some galvanized iron, ductile iron and asbestos cement pipes. Polyethylene is used for service lines and some high density polyethylene pipes may be found in the distribution system. At the time of the 2010 sanitary survey, it was reported that, due to the lack of reliable and accurate maps of the system at the time of the upgrades, it was likely that some of the old abandoned mains may remain charged with water and not physically disconnected from the system. If true, this could cause stagnant water to be drawn into the system under conditions of high water demand.

The system is designed to provide adequate working pressure at all services. Most of the system is looped and there are nine pressure reducing stations. Most of the distribution system is considered to be in relatively good condition and without excessive losses due to leakage. However, many of the older homes reportedly have leaks in service lines and/or plumbing systems. This causes high water use per service connection in some parts of the system.

The distribution system has three areas which are, for practical purposes, hydraulically separated from each other. One (DS001) serves the west side of the PWS and everything south of HWY 264. Water is pumped into this system from GW002 and GW003 (when GW003 is active) and storage is provided by ST001. The second and largest distribution system (DS003) serves the central portion of the system including everything north of HWY 264 and west of DS001. GW004 provides the water for this distribution system and ST002 provides its

storage. DS003 also provides the water for PF002 which pumps water up to the upper mesa facilities. The third and final portion of the system (DS002) is located on the upper mesa and serves the homes in that pressure zone. As discussed above, PF001 pumps water from DS003 to ST003 on the mesa. PF002 pumps the water from ST003 and charges DS002.

J. Management and Operation

The Polacca PWS is owned by the First Mesa Consolidated Villages and serves the villages of Walpi, Sichomovi and Tewa. These three villages make up the community of Polacca. Ivan Sidney is the business manager for the FMCV and oversees the operation and maintenance of the PWS. Ivan Sidney answers to the Tribal Board which is made up of the traditional leaders of the clans and whose membership varies from three to 12 members. Gail Poley serves as the Community Service Administrator for the village of Walpi.

The PWS has a water use rate structure and an enforced shut-off policy. Residential connections are charged a \$15 monthly fee for water and sewer. There is a three tiered water and sewer rate structure for the non-residential connections. Fourteen of these connections pay \$52 per month, three pay \$15 per month and the Hopi Health Care Center and the First Mesa Elementary School are both metered and pay \$.0085 per gallon. At the time of the sanitary survey, Sharon Grover, of FMCV's main office, provided SGECC with a summary of the previous month's collections which showed an 84 percent collection rate. Of the 478 residential connections, 76 (16 percent) of the connections were shut off due to delinquency or a voluntary shut off request. One of the 19 non-residential connections was shut off on a voluntary request.

The water system is not self-supporting and this and previous sanitary surveys have showed it to be suffering from many years of inadequate funding and maintenance. During each sanitary survey, the management and staff appear to be interested in improving the PWS and ensuring its long-term viability. However, for reasons unknown to SGECC, not much seems to get done in terms of improvements or corrective and preventive maintenance.

Cross-connection control: Past sanitary survey reports have recommended that the FMCV management implement a cross-connection control program to ensure protection of the PWS. The program has not been established. During the survey, the IHS health facility was visited and backflow prevention assemblies at that site were inspected (Photos 38-40). It was discovered that the backflow prevention assemblies have not been tested annually as required (although the IHS has recently had a staff member trained and certified and testing will begin as soon as his equipment is calibrated). Also, the service line to the building is not properly protected. The backflow prevention assembly in place is not appropriate for the degree of hazard. Further, the backflow prevention assembly has an unprotected bypass (Photo 38). The service line should be equipped with a reduced pressure

principle backflow prevention assembly (RP) and the bypass should have a meter and another RP assembly.¹

K. Operator Compliance with EPA Requirements

Alfonso Sekeva Jr. is the primary water operator and Wally Youvella assists Alfonso when needed. Neither operator is certified.

L. Deficiencies and Recommendations

Following is a list of deficiencies and recommendations for the system based on information gathered during the sanitary survey. Each deficiency is ranked in order of severity and is assigned a **Health Risk Priority** number.

Deficiencies assigned a **Health Risk Priority 1** present a serious health risk. Health Risk Priority 1 deficiencies should be corrected immediately.

Deficiencies assigned a **Health Risk Priority 2** present a critical system defect, critical operational defect, or potential health hazard. Health Risk Priority 2 deficiencies should be corrected as soon as possible.

Deficiencies assigned a **Health Risk Priority 3** present a critical system defect, critical operational defect, or potential health hazard, but are not as significant as Health Risk Priority 2. Health Risk Priority 3 deficiencies should be corrected as workload allows.

Deficiencies assigned a **Health Risk Priority 4** present a system defect, operational defect, or potential contamination hazard and are costly to correct. Health Risk Priority 4 deficiencies should be addressed in any long-range water system improvement project.

Deficiencies assigned a **Health Risk Priority 0** are suggestions for improvement, but are not a health risk.

Deficiencies marked with an asterisk (*) were also identified in the 2010 sanitary survey report.

- 1. Management (M1, M2, M4 & M5 – Health Risk Priority 1 – Significant Deficiency):** For many years, management of the PWS has failed to address and correct system deficiencies. Examples of those failures are listed below in deficiencies two through 18.

Recommendation: As required by 40 CFR 141.403, within 30 days of receipt of this sanitary survey report, the PWS must consult with EPA Region 9 regarding appropriate corrective actions. Within 120 days (or earlier if directed by EPA Region

¹ Refer to the Foundation for Cross-Connection Control and Hydraulic Research's *Manual of Cross-Connection Control* and the American Water Works Associations Manual 14, *Recommended Practice for Backflow Prevention and Cross-Connection Control* for information.

9), the PWS must have completed appropriate corrective actions or be in compliance with an EPA-approved corrective action plan and schedule.

2. **Automation*² (PF001- P3 – Health Risk Priority 1):** PF001 is designed to be controlled automatically with a pressure transducer and radio telemetry. The automation has not been functional for years. Therefore, the booster pumps that pump water from the distribution system to the 8,000-gallon storage tank (ST003) on the mesa are controlled by the water operators manually and with a time clock. This often causes the tank to overflow when the operators guess wrong and operate the pump too long (the tank was overflowing when it was inspected during the sanitary survey). If the pumps are not operated long or frequently enough, it can also cause loss of service and positive pressure on the mesa if the pump is not operated long or often enough. Loss of service and positive pressure will cause backsiphonage of contaminants into the distribution system and could lead to waterborne disease.

Recommendation: Install automation to ensure continuous water service and positive pressure on the mesa. Because of the high pump discharge pressures, the automation should be designed by a professional engineer to ensure that all facilities, including vessels that may be used for prevention of water hammer, are certified for the expected pressure surges.

3. **Redundancy at booster pumping facilities* (PF001 – P2 – Health Risk Priority 1):** PF001 has only one pump that is operational. The other pump has apparently been out of service for roughly eight years. As noted above, this can cause loss of service and pressure and lead to public health risks.

Recommendation: Make repairs and/or replacements as necessary to ensure the necessary redundancy is present.

4. **Inadequate source redundancy* (GW003 – S2 – Health Risk Priority 1):** Community PWSs should be able to produce the maximum day demand with the largest well out of service. It is unlikely that the system can do so because Well 5 is out of service. Neither of the operable wells is likely to be capable of meeting this standard.

Recommendation: Well 5 should be repaired and put back in service.

5. **Well protection (GW002, GW003 & GW004 – S1b – Health Risk Priority 1) Photos 2, 3 & 7):** The wells have sanitary deficiencies that are in need of correction.

- GW002's electrical conduit has pulled apart and its sanitary seal is missing one bolt.
- GW003 is in a low area where water can pool to migrate down the casing and contaminate the water. The sanitary seal appears to be missing its gaskets.
- GW004 has a sanitary seal that is missing a nut from one of its bolts.

² Deficiencies marked with an asterisk (*) were also identified in the 2010 sanitary survey report.

Recommendation: These deficiencies should be corrected. Inspection of the wells for sanitary deficiencies should be a regular part of the PWS's preventive maintenance program.

6. Condition of storage tank* (ST003 – ST1 – Health Risk Priority 1) Photos 27-32:

The 8,000-gallon welded steel storage tank located on the mesa is in very poor condition. It shows signs of corrosion at the top and bottom seams and is leaking from the bottom seam. There are also openings in the roof of the tank that will allow contaminant entry. This tank is essential for provision of service and maintenance of positive pressure in the mesa distribution system.

Recommendation: The tank may very well be beyond the point where it is cost effective to rehabilitate it. In any event, it must be rehabilitated or replaced. In the interim, all openings in the roof should be sealed, the target repaired or replaced and a gasket provided for the hatch cover. ***These recommendations are still relevant even though the tank is scheduled for replacement. They are necessary in order to limit the potential for contaminants to enter the stored water and they should have been taken care of years ago.***

7. Hatch cover gaskets (ST001, ST002 & ST003 – ST1 – Health Risk Priority 1) Photos 14, 20, 28 & 29): The tanks' hatch covers do not have gaskets capable of preventing dust, insects and spiders from entering the tanks and contaminating the water.

Recommendation: New gaskets should be provided for the hatch covers. The material used for the gaskets should be certified by the National Sanitation Foundation for contact with potable water. Inspection of the tanks for sanitary deficiencies should be a regular component of the PWS's preventive maintenance program.

8. Vent screen (ST001 – ST1 – Health Risk Priority 1) Photo 13: The tank's vent is screened but the screen's mesh size is too large to exclude insects.

Recommendation: A non-corrodible insect screen should be installed on the vent.

9. Inadequate water rates* (M1 – Health Risk Priority 2): The existing water rates are not adequate to cover the costs of operating and maintaining the water system. This is especially true at this time because necessary repairs, replacements and maintenance have been postponed or neglected for many years.

Recommendation: A new rate structure should be developed that will provide enough income to make the system self-supporting over the long term. The rates should be based on metered water use (not flat rates) and should be structured as an increasing block system so that each subsequent block of water use (e.g., 1,000 gallons or 100 cubic feet) increases in cost to the user. Such rates encourage responsible water use and tend to make users repair leaks in their service lines and plumbing systems.

All services should be provided with meters and consideration should be given to remote-read meters to reduce manpower demands.

10. Cross-connection control* (D3 – Health Risk Priority 2) Photos 38-40: The water system has service connections and water uses that provide risks from backflow and/or backsiphonage. Most of these high risk uses, but perhaps not all, are equipped with backflow prevention assemblies that are capable of protecting the water system. These assemblies must be tested on an annual basis by a person trained and certified to conduct such tests. This is not occurring. Many of the backflow prevention assemblies are several years old and may no longer be functional. ***During the on-site portion of the survey, it was discovered that backflow prevention assemblies at the IHS health center have not been tested as required and that the main service line is not properly protected.***

Recommendation: Adopt a cross-connection control program that ensures each high risk service connection is properly protected and that all backflow prevention assemblies are tested on an annual basis. Each assembly should be tagged by the certified inspector with the date and results of the inspection. Records must be provided to the water system so such testing and, if necessary repair, can be tracked and will become a part of preventive maintenance activities.

11. Automation* (GW002, GW003, GW004, TP001 & TP002 - S3 & T3 - Health Risk Priority 2): The wells and treatment plants were designed with automation. The automation is not functional; therefore, they are operated manually and with time clocks. The pumping time is gauged to meet demand and fill the tank(s). This is a guesswork method of operation at best and requires excessive water operator time for tasks that should be taken care of automatically. It also causes water to be wasted and erosion and environmental damage to occur.

Recommendation: All wells should be provided with controls that start and stop pumps based on water elevations in the East and West Tanks.

12. Tank cleaning and inspection* (ST001 – ST4 – Health Risk Priority 2) Photos 18-23: The 200,000-gallon West Tank shows significant corrosion of the interior ladder, roof support beams and hatch. Long term use of this tank appears to be very desirable in order to hydraulically balance the east and west sides of the distribution system. This is likely true whether or not the regional water system becomes a reality.

Recommendation: The tank should be inspected and recoating and repairs should be completed as necessary based on the results of the inspection.

13. Operator Certification (M1 – Health Risk Priority 2: The PWS does not have operators that have been trained and certified in water treatment and water distribution.

Recommendation: At least two staff members should receive the appropriate training and obtain certification in both water treatment and water distribution.

14. Staff* (M1 – Health Risk Priority 3: The system appears to be short-staffed. This is particularly true because automation is either inoperable or non-existent, requiring operators to perform tasks of monitoring and controlling facilities that would not normally be necessary.

Recommendation: Continue the cross-training of security personnel so they can help with the workload and provide on-call relief to the operators on weekends and holidays. Such staff should be trained and become certified.

- 15. Source water protection and security* (GW002, GW003 & GW004 - S4 – Health Risk Priority 3) Photos 2, 3 & 6:** The wellheads are not protected from livestock or vandalism.

Recommendation: The wells should be fenced and the well heads should be provided with locking protective devices to keep vandals from introducing contaminants into the casing.

- 16. Storage tank security* (ST001 & ST002 - S4 – Health Risk Priority 3 – Photos 17 & 18):** The tanks' security fences are in need of repair.

Recommendation: The fences should be repaired. Inspection and repair should be a regular part of the PWS's preventive maintenance program.

- 17. Operation and maintenance manual* (M2 – Health Risk Priority 2):** The system has had difficulty in maintaining a stable crew of operators over the past several years and new operators learn their jobs by trial and error. A detailed operation and maintenance manual would be effective at alleviating such problems.

Recommendation: An operator friendly operation and maintenance manual should be prepared. This can be done by operators (although it obviously takes time they now don't have). Digital photographs can be taken of facilities and controls with step-by-step instructions on the daily activities of the operators.

- 18. Tank cleaning and inspection* (ST002 – ST4 – Health Risk Priority 3) Photos 20-22:** The 500,000-gallon East Tank is beginning to show early signs of corrosion. The tank should be inspected and repaired as necessary in order to ensure its long-term usefulness.

Recommendation: The tank should be inspected and recoating and repairs should be completed as necessary based on the results of the inspection.

- 19. Emergency Planning – (M2 - Health Risk Priority 4):** A public water system should have an emergency response plan in place that also includes a section that addresses what the system should do in case no water can be served to the community for a period of time ranging from a few hours to months. The water shortage/outage could be due to issues such as a water line break, the emptying of a storage tank, or the effects of the on-going drought in the southwestern United States.

Recommendation: It is suggested that management immediately prepare or revise an emergency response plan to ensure the continued operation of the water system due to a water shortage/outage. Planning has to be site specific but generally should consider, but not be limited to, the following:

- Alternative sources.

- Water conservation.
- Lowering well pumps (may require new pumps to handle the increased discharge head).
- Redevelopment of existing wells, including both active and inactive wells.

20. Safety issues* (M2 – Health Risk Priority 0): The operators are exposed to safety risks on a daily basis and water operations is considered a relatively high risk occupation. Accidents and deaths are typically caused by falls, chemical exposure, trenching accidents, electrocution and confined spaces. The PWS does not appear to have an effective safety program and not all of the appropriate safety equipment is provided.

Recommendation: Safety equipment and training should be provided for falls, chemical handling, trenching and confined spaces. It is also important to see that all facilities that have electrical service are equipped with ground fault interrupter (GFI) circuits. GFI devices are designed to detect imbalance between the energized conductor and the return neutral conductor (such as current leakage through the body of a person who is grounded and accidentally touches the energized part of the circuit) and disconnect quickly to mitigate harm (definition from Wikipedia).

21. Hydropneumatic tank* (HP001 & PF002 – D4 – Health Risk Priority 0): The booster pumps on the mesa cycle frequently and run for only a short time. This can be hard on pumps and may cause premature failure.

Recommendation: Someone with expertise in air/water interface hydropneumatic tanks should inspect the pumps' off/on settings and the air/water ratio to see if more efficient and protective settings can be reached. The structural integrity of the hydropneumatic tank should also be investigated as internal corrosion can sometimes cause a dangerous catastrophic failure because of the compressed air within the tank.

22. Erosion* (ST001 and ST002 – ST1 – Health Risk Priority 0): Significant erosion has occurred at the overflows of the East and West Tanks. Not all of the erosion has been caused by the tanks overflowing but a great deal has.

Recommendation: Steps should be taken to minimize future erosion.

23. Corrosion (TP001 – T2 – Health Risk Priority 0): The chlorine facilities are located in the same room with the meters and controls making corrosion a concern.

Recommendation: Corrosion can be limited to some extent by sealing the chlorine container and venting it to the outside of the building. The vent line will allow air to move into the vat as chlorine is withdrawn while limiting the off-gassing of chlorine inside the building.

II. Sanitary Survey Form, Maps, and Schematics

SANITARY SURVEY FORM - INVENTORY

Page 1 of 19

PWSID: 0400106

SYSTEM NAME Polacca

DATE OF SURVEY April 7, 2014

RESERVATION Hopi

SURVEYOR NAME -Dan Fraser, PE and JanDee May of Sleeping Giant Environmental Consultants, LLP

(SYSTEM REPRESENTATIVE) Ivan Sidney, Business Manager

(OTHER REPRESENTATIVE) Alfonso Sakeva, Water Operator

SYSTEM ADDRESS

Addressee Ivan Sidney, FMCV Business Manager
Primary Address

Street PO BOX 260

City POLACCA State AZ Zip 86042

System Phone (928)737-2670 Fax (928)737-2347

SYSTEM OWNER

Addressee Alfonso Sakeva, Operator
Owners Address

Street Same address

City _____ State _____ Zip _____

Owner Phone (928) 737-2670 Fax (_____) _____

LOCATION OF SYSTEM

Nearest City Tuba City, AZ

Description or Physical Address About 70 miles southeast of Tuba City. See maps and driving instructions on Page 19.

ALTERNATE OPERATOR OF SYSTEM

Paid Position? ☒ Yes ☐ No

Name Alfonso Sakeva, Operator

Certified Operator? ☐ Yes ☒ No ☐ Not required

Treatment Certification Level _____

Distribution Certification Level _____

Treatment Certification date _____

Distribution Certification date _____

Treatment Certification # _____

Distribution Certification # _____

Treat Certification Authority

Distribution Certification Authority

CA DHS ☐ ITCA ☐ CA DHS ☐ ITCA ☐AZDEQ ☐ NVDEP ☐ AZDEQ ☐ NVDEP ☐Copy of Certificate? ☐ Yes ☐ No Certification # _____

Phone # (928) 737-2670

Employees Residing on Reservation: 2 Full Time 2 Part Time

ALTERNATE OPERATOR OF SYSTEM

Paid Position? ☒ Yes ☐ No

Name Wally Youvella, maintenance/backup operator

Certified Operator? ☐ Yes ☒ No ☐ Not required

Treatment Certification Level _____

Distribution Certification Level _____

Treatment Certification date _____

Distribution Certification date _____

Treatment Certification # _____

Distribution Certification # _____

Treat Certification Authority

Distribution Certification Authority

CA DHS ☐ ITCA ☐ CA DHS ☐ ITCA ☐AZDEQ ☐ NVDEP ☐ AZDEQ ☐ NVDEP ☐Copy of Certificate? ☐ Yes ☐ No Certification # _____

Phone # (928) 737-2670

Employees Residing on Reservation: 2 Full Time 2 Part Time

☒ A = Active ☐ P = Pending (Add New System)☐ I = Inactive☒ C = Community☐ NTNC = Non-Transient Non-Community☐ TNC = Transient Non-CommunityTotal Service Connections: Residential / Non-Transient: 517
Transient: 10Total Active Connections: Residential / Non-Transient: 517
Transient: 10Service Connections Metered? ☒ Yes ☐ No
Percent Metered 80 %

Rates and Rate Structure See discussion of rates in Section J of the report.

Collection Rate 84%

Resident Population

Summer: 2,540

(Number of permanent residents utilizing PWS daily)

Winter: 2,540

Non-Transient Population

Summer: 30

(Number of non-transient persons utilizing PWS daily)

Winter: 30

Transient Population

Summer: 30

(Number of transient persons served by PWS daily)

Winter: 30

Total: 2,600

OWNER TYPE

☐ 3 State Government☒ 6 Native American☒ DC Day Care Center☐ DI Dispenser☒ HS Head Start☐ HA Homeowners Assoc.☐ HM Hotel/Motel☐ IN Institution☒ MF Medical Facility☐ MH Mobile Home Park☐ MU Municipality☐ OA Other Area☐ ON Other Non-Transient Area (Average Daily Visitors TNC)

Service Category Description _____

☒ RA Residential Area☐ RE Retail Employees☐ RS Restaurant☐ RV RV Park☒ SC School☐ SS Service Station☐ SU Subdivision☐ WB Water Bottler☐ WH Wholesaler (Sells Water)☒ HOPI VILLAGE

Comments: SGEC has had some difficulty in determining exactly what the PWS serves. The above numbers are estimates and include residential housing in the villages, schools, 2 churches, offices, the headstart, a housing authority administration building, housing authority yard, and the IHS health care center (with staff housing).

The water rates do not cover the system's normal costs of operation and the collection rate is not satisfactory. An undetermined number of homes (30 estimated) are connected to the PWS illegally and do not pay for service.

The system shows signs of years of neglect. Part of this is likely caused by inadequate funding but many of the sanitary deficiencies could easily be corrected if there was a will to do so.

SANITARY SURVEY FORM – WATER SYSTEM FACILITIES

Page 2 of 19

PWSID 0400106

SYSTEM NAME Polacca

Water System Facilities (WSF) numbers are WSF Type Codes plus an assigned number. (i.e. all facility numbering starts with 001. See instruction sheet for a list of WSF Type Codes. When a source is operational it is considered Active, this includes systems that are seasonal. Inactive sources are those which are shut down but can return to active status, such as a system out of business. Proposed sources are those that have been identified through the Plan Review process, but are not connected to the water system.

A water source facility is a well, spring, intake, infiltration gallery or consecutive connections from which a system draws or purchases water:

Total Number of Source Facilities Three active ground water sources.

WATER SYSTEM FACILITIES SUMMARY (WSF)

Water

WSF ID	Facility Name	Type Code	Seller PWSID	Status/Date	Flows To
GW002	West Well 6	GW		A/Unk	TP001
GW003	West Well 5	GW		I/2006	TP001
GW004	East Well 8	GW		A/2003	TP002
TP001	Chlorination Unit for Wells 5 and 6			A/Unk	EP001
TP002	Chlorination Unit for Well 8			A/2003	EP002
EP001	Entry Point for the West Wells			A/2003	DS001
TM001	Transmission Main for TP002			A/Unk	ST002
EP002	Entry Point for the East Well			A/Unk	TM001
PF001	Pumping Facility to Upper Mesa System			A/Unk	TM002
TM002	Transmission Main for Upper Mesa Tank			A/Unk	ST003
ST003	Upper Mesa Storage Tank			A/Unk	HP001
HP001	Hydropneumatic Tank 1			A/Unk	PF002
PF002	Upper Mesa Pumping Facility			A/Unk	DS002
DS001	Distribution System for West and South Polacca			A/Unk	ST001
ST001	Older West Storage Tank			A/1977	DS001
DS002	Distribution for the Upper Mesa			A/Unk	NA
ST002	Newer East Storage Tank			A/1998	DS003
DS003	Distribution System for East and Central Polacca			A/Unk	DS001 & PF001

EMERGENCY POWER

Does the system have emergency power?

☐ Yes ☒ No

If yes, what type: _____

Frequency of testing: The Village Utility Maintenance Coop has a generator.Record of primary power failures: Unk in last year Switchover: ☐ Automatic ☐ Manual

The system has other facilities that are not in use and are effectively abandoned. Two 33,000-gallon side-by-side tanks on the east side were abandoned because they are at a lower elevation than the two large tanks. Their service area is served by the 0.5 mg tank on the east side. Additionally, there are other wells on the west side of the system that have been abandoned because of high nitrate and other TDS issues.

Comments: The system shows signs of inadequate funding and long-term neglect/manpower shortage. However, many of the problems could be corrected relatively easily and inexpensively. For some reason unknown to SGEC, they are not corrected even though recommendations for correction have been in previous sanitary survey reports.

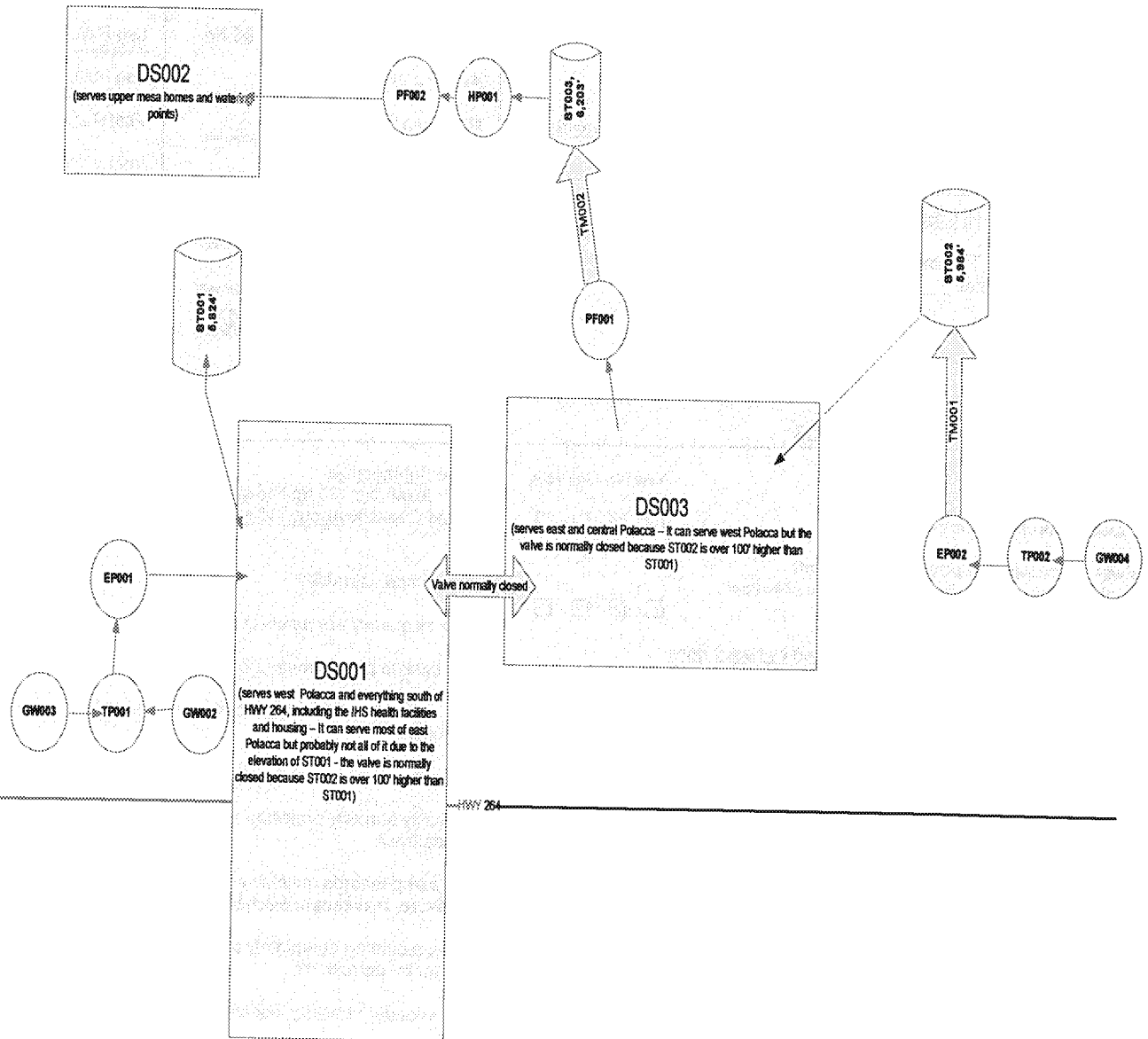
SANITARY SURVEY FORM – AERIAL PHOTOS

Page 3 of 19

PWSID 0400106

SYSTEM NAME Polacca

Flow Diagram



SANITARY SURVEY FORM – WELLS & WELL PUMPS

Page 4 of 19

PWSID 0400106

SYSTEM NAME Polacca

STATUS OF SOURCE ☒ (A)ctive ☐ (I)inactive ☐ (P)roposed

WELL LOG AND TEST DATA

WSF ID GW002

Entry Point ID EP001

These are State assigned identification numbers

Source Name West Well 6

Name of Source - Example: Well 1 or South well, etc.

Location of Water Source (TRS or street address) West side of Polacca.

Entry Point Name Entry Point for the West Wells

Name of EP - Example: Entry point for North Well 1 & South Well 2

Location of Entry Point Post TP001

 Available ☒ Perm ☐ Emerg ☐ Interim ☐ Seasonal ☐ Other
 If seasonal: _____ to _____
GWUDISW PA Completed ☒ Yes ☐ UNKLog Available? ☐ Yes ☒ NoAverage Production Unk
indicate unitsMaximum Production Unk
indicate unitsDate Drilled Unk
If well... date drilledCasing Size 12' Steel surface
casing (based on pitless unit).
size of casing installed in wellCase Depth Unk
depth of casing installed in wellWell Depth Approximately 915'
depth of well expressed in feetGrout Depth Unk
depth of grout used to seal well wallsLog SWL Unk
(static) expressed in feet below ground elevationLog PWL Unk
(pumping) expressed in feet below ground elevationTest Pump Rate UnkIntake Type Unk
type of intake mechanismScreened Interval Unk
expressed in feet below ground elevationWell Yield Unk
pump tested in gallons per minute

WELLS

Yes No Unk N/A

Is well site protected from flooding? ☐ ☒ ☐ ☐Is well protected from potential sources of pollution (includes: surface water, known chemical spills, agricultural use, etc.)? ☐ ☒ ☐ ☐If no... explain The area has been flooded by heavy rains.
 Does casing extend at least
☒ 18 inches above outside ground level;
☐ 12 inches above finished floor inside well house; and
☐ 3 feet above 100 year flood elevation?
 (Check for appropriate distance) ☒ ☐ ☐ ☐
Is top of the well casing properly sealed? (sanitary seal) ☒ ☐ ☐ ☐Is well vented? ☒ ☐ ☐ ☐Is well vent properly screened and terminated in a downward position? ☒ ☐ ☐ ☐
 Does well have suitable sampling tap? Raw Water ☒ ☐ ☐ ☐
 Treated ☒ ☐ ☐ ☐
Are check valves, blow-off valves and water meters maintained and operating properly? ☒ ☐ ☐ ☐Is upper termination of well protected (housed or fenced)? ☐ ☒ ☐ ☐Is intake located below the maximum drawdown? ☒ ☐ ☐ ☐Is there a concrete pad around well head? ☐ ☒ ☐ ☐

PUMPS

 Type Submersible
 (example: 30 hp line shaft turbine)
 Rated Capacity About 130 gpm per the meter.

Yes No Unk N/A

Are pumps operable? ☒ ☐ ☐ ☐How frequently are pump(s) replaced? _____ ☒ ☐Are backup pumps/motors provided? ☐ ☒ ☐ ☐Are controls functioning properly and adequately protected? ☐ ☒ ☐ ☐Do underground compartments have a drain? ☐ ☐ ☐ ☒Is facility properly protected against trespassing and vandalism? ☐ ☒ ☐ ☐Are pump records maintained (amp, drawdown, discharge, pressure, maintenance schedule, manuals, etc.)? ☒ ☐ ☐ ☐Is the plumbing adequately painted to prevent excessive corrosion? ☐ ☐ ☐ ☒Are adequate heating, lighting, and ventilation provided? ☐ ☐ ☐ ☒Is a preventive maintenance program in operation? ☐ ☒ ☐ ☐Are recommended spare parts on hand? ☐ ☒ ☐ ☐Cross connections observed? ☐ ☒ ☐ ☐

Comments: (Such as, detailed information on any items with identified deficiencies)

The electrical conduit is broken offering a route for contaminants (e.g., insects & dust) to enter the well.

 Explain Controls: Wells 5 and 6 are designed to be turned off and on based on the water levels in the west side tank. These controls do not work and the operators have to use a timer.

 Comments: Security is inadequate. This well's TDS is reportedly higher than that of Well 5 (GW003).

SANITARY SURVEY FORM – WELLS & WELL PUMPS

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PWSID 0400106

SYSTEM NAME Polacca

 STATUS OF SOURCE ☐ (A)ctive ☒ (I)nactive ☐ (P)roposed

WELL LOG AND TEST DATA

WSF ID GW003

Entry Point ID EP001

These are State assigned identification numbers

Source Name West Well 5 - (most westerly of all active wells).

Name of Source – Example: Well 1 or South well, etc.

Location of Water Source (TRS or street address) West side of Polacca about 160 yards west of GW002 - TP is in between the two wells.Entry Point Name Entry Point for the West Wells

Name of EP – Example: Entry point for North Well 1 & South Well 2

Location of Entry Point Post TP001.Available ☒ Perm ☐ Emerg ☐ Interim ☐ Seasonal ☐ Other

If seasonal: _____ to _____

GWUDISW PA Completed ☒ Yes ☐ UNKLog Available? ☐ Yes ☒ NoAverage Production Unk indicate unitsMaximum Production Unk indicate unitsDate Drilled Unk if well... date drilledCasing Size 12" steel surface casing (based on pitless unit).Case Depth UnkWell Depth 910'Grout Depth Unk depth of grout used to seal well wallsLog SWL Unk

(static) expressed in feet below ground elevation

Log PWL Unk

(pumping) expressed in feet below ground elevation

Test Pump Rate UnkIntake Type Unk

type of intake mechanism

Screened Interval Unk

expressed in feet below ground elevation

Well Yield Unk

pump tested in gallons per minute

WELLS

Yes No Unk N/A

Is well site protected from flooding?

☐ ☒ ☐ ☐

Is well protected from potential sources of pollution (includes: surface water, known chemical spills, agricultural use, etc.)?

☐ ☒ ☐ ☐If no... explain The site has experienced flooding during heavy rains - not in a waterway flood plain, however. The area around the well is not properly graded.

Does casing extend at least

☒ 18 inches above outside ground level;☐ 12 inches above finished floor inside well house; and☐ 3 feet above 100 year flood elevation?

(Check for appropriate distance)

☒ ☐ ☐ ☐

Is top of the well casing properly sealed? (sanitary seal)

☒ ☐ ☐ ☐

Is well vented?

☒ ☐ ☐ ☐

Is well vent properly screened and terminated in a downward position?

☒ ☐ ☐ ☐

Does well have suitable sampling tap?

Raw Water

☒ ☐ ☐ ☐

Treated

☒ ☐ ☐ ☐

Are check valves, blow-off valves and water meters maintained and operating properly?

☐ ☐ ☒ ☐

Is upper termination of well protected (housed or fenced)?

☐ ☒ ☐ ☐

Is intake located below the maximum drawdown?

☐ ☐ ☒ ☐

Is there a concrete pad around well head?

☐ ☒ ☐ ☐

PUMPS

Type 40-hp Grudfos Submersible Model 150S400-18

(example: 30 hp line shaft turbine)

Rated Capacity Water Pumps Pro website says this pump produces 150 gpm.

Yes No Unk N/A

Are pumps operable?

☐ ☒ ☐ ☐How frequently are pump(s) replaced? 2012☒ ☐

Are backup pumps/motors provided?

☐ ☒ ☐ ☐

Are controls functioning properly and adequately protected?

☐ ☐ ☒ ☐

Do underground compartments have a drain?

☐ ☐ ☐ ☒

Is facility properly protected against trespassing and vandalism?

☐ ☒ ☐ ☐

Are pump records maintained (amp, drawdown, discharge, pressure, maintenance schedule, manuals, etc.)?

☐ ☐ ☐ ☒

Is the plumbing adequately painted to prevent excessive corrosion?

☐ ☐ ☐ ☒

Are adequate heating, lighting, and ventilation provided?

☐ ☐ ☐ ☒

Is a preventive maintenance program in operation?

☐ ☒ ☐ ☐

Are recommended spare parts on hand?

☐ ☐ ☒ ☐

Cross connections eliminated?

☒ ☐ ☐ ☐

Comments: (Such as, detailed information on any items with identified deficiencies)

Well 5 has been offline for years.Explain Controls: Wells 5 and 6 are designed to be turned off and on based on the water levels in the west side tank. These controls do not work and the operators have to use a timer.Comments: Security is inadequate. The well is easily accessed and is not fenced or otherwise protected.

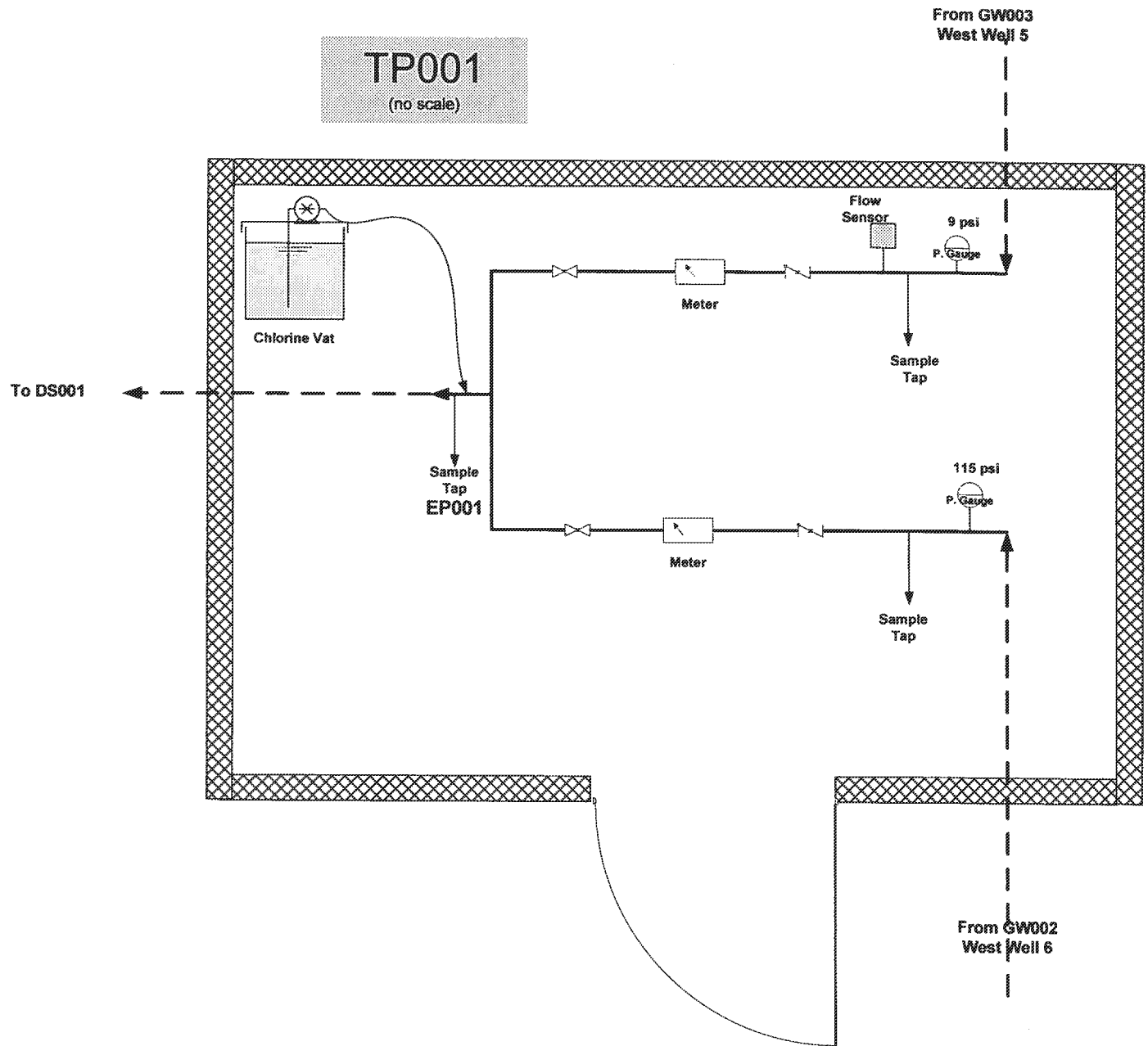
SANITARY SURVEY FORM – AERIAL PHOTOS

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PWSID 0400106

SYSTEM NAME Polacca

Schematic



SANITARY SURVEY FORM – WELLS & WELL PUMPS

Page 7 of 19

PWSID 0400106

SYSTEM NAME Polacca

 STATUS OF SOURCE ☒ (A)ctive ☐ (I)inactive ☐ (P)roposed

WELL LOG AND TEST DATA

WSF ID GW004

Entry Point ID EP002

These are State assigned identification numbers

Source Name East Well 8

Name of Source – Example: Well 1 or South well, etc.

 Location of Water Source (TRS or street address) On the east side of Polacca, below (SE) of ST002.
Entry Point Name Entry Point for the East Well

Name of EP – Example: Entry point for North Well 1 & South Well 2

Location of Entry Point Post TP002
 Available ☒ Perm ☐ Emerg ☐ Interim ☐ Seasonal ☐ Other
 If seasonal: _____ to _____
GWUDISW PA Completed ☐ Yes ☒ UNKLog Available? ☐ Yes ☒ NoAverage Production Unk indicate unitsMaximum Production Unk indicate unitsDate Drilled Unk if well... date drilledCasing Size 8" steel size of casing installed in wellCase Depth 1120' depth of casing installed in wellWell Depth 1120' depth of well expressed in feetGrout Depth Unk depth of grout used to seal well wallsLog SWL Unk (static) expressed in feet below ground elevationLog PWL Unk (pumping) expressed in feet below ground elevationTest Pump Rate UnkIntake Type Unk type of intake mechanismScreened Interval Unk expressed in feet below ground elevationWell Yield 125 gpm pump tested in gallons per minute

WELLS

Yes No Unk N/A

Is well site protected from flooding? ☒ ☐ ☐ ☐
 Is well protected from potential sources of pollution (includes: surface water, known chemical spills, agricultural use, etc.)? ☒ ☐ ☐ ☐

If no... explain _____

 Does casing extend at least
☒ 18 inches above outside ground level;
☐ 12 inches above finished floor inside well house; and
☐ 3 feet above 100 year flood elevation?
 (Check for appropriate distance) ☒ ☐ ☐ ☐
Is top of the well casing properly sealed? (sanitary seal) ☒ ☐ ☐ ☐Is well vented? ☒ ☐ ☐ ☐Is well vent properly screened and terminated in a downward position? ☒ ☐ ☐ ☐
 Does well have suitable sampling tap? Raw Water ☒ ☐ ☐ ☐
 Treated ☒ ☐ ☐ ☐
Are check valves, blow-off valves and water meters maintained and operating properly? ☒ ☐ ☐ ☐Is upper termination of well protected (housed or fenced)? ☐ ☒ ☐ ☐Is intake located below the maximum drawdown? ☒ ☐ ☐ ☐Is there a concrete pad around well head? ☐ ☒ ☐ ☐

Comments: (Such as, detailed information on any items with identified deficiencies)

East Well 8 (GW004) is outside the pump house's security fence. Pump house is a block building in good condition. The well has no security fence and its sanitary seal is not equipped with a locking device.

PUMPS

 Type Submersible
 (example: 30 hp line shaft turbine)
 Rated Capacity 92 gpm per the meter.

Yes No Unk N/A

Are pumps operable? ☒ ☐ ☐ ☐How frequently are pump(s) replaced? NEW PUMP 2006Are backup pumps/motors provided? ☐ ☒ ☐ ☐Are controls functioning properly and adequately protected? ☒ ☐ ☐ ☐Do underground compartments have a drain? ☐ ☐ ☐ ☒Is facility properly protected against trespassing and vandalism? ☐ ☒ ☐ ☐Are pump records maintained (amp, drawdown, discharge, pressure, maintenance schedule, manuals, etc.)? ☒ ☐ ☐ ☐Is the plumbing adequately painted to prevent excessive corrosion? ☐ ☐ ☐ ☒Are adequate heating, lighting, and ventilation provided? ☐ ☐ ☐ ☒Is a preventive maintenance program in operation? ☐ ☒ ☐ ☐Are recommended spare parts on hand? ☐ ☒ ☐ ☐Cross connections observed? ☐ ☒ ☐ ☐

Explain Controls: The well has to be controlled manually and the treatment plant has to be controlled manually and separately as the flow switch is out of service. The automation with the pressure transducer doesn't work nor does the time clock (the same was true at the time of the last sanitary survey).

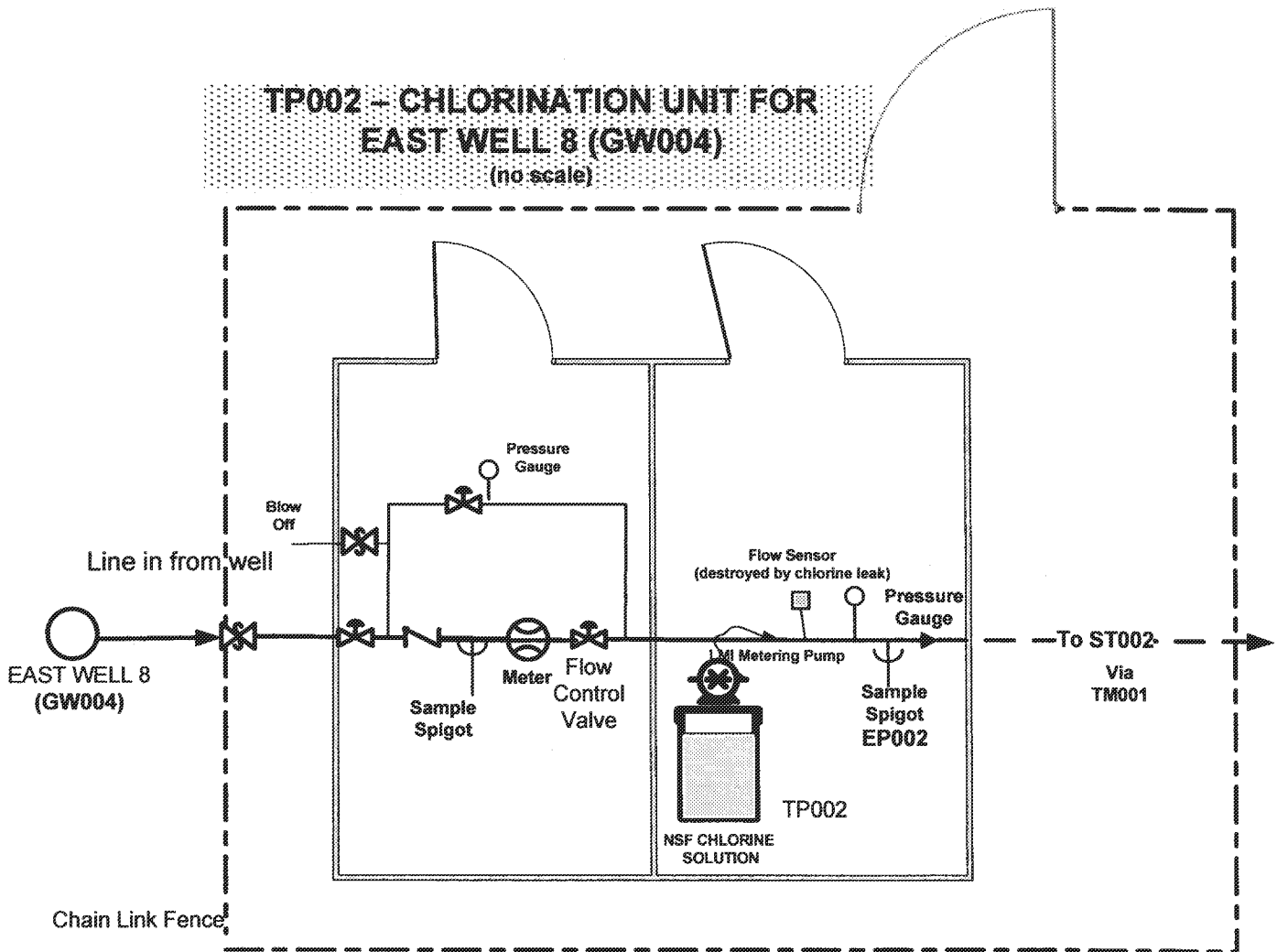
SANITARY SURVEY FORM – WELLS & WELL PUMPS

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PWSID 0400106

SYSTEM NAME Polacca

Schematic of Installation



SANITARY SURVEY FORM - PUMPING FACILITIES (Other than Well Pumps)

Page 9 of 19

PWSID 0400106

SYSTEM NAME Polacca

WSF ID PF001

These are State assigned identification numbers

Number of Pumps TwoType: 10-hp, 53 gpm vertical turbine pumps.

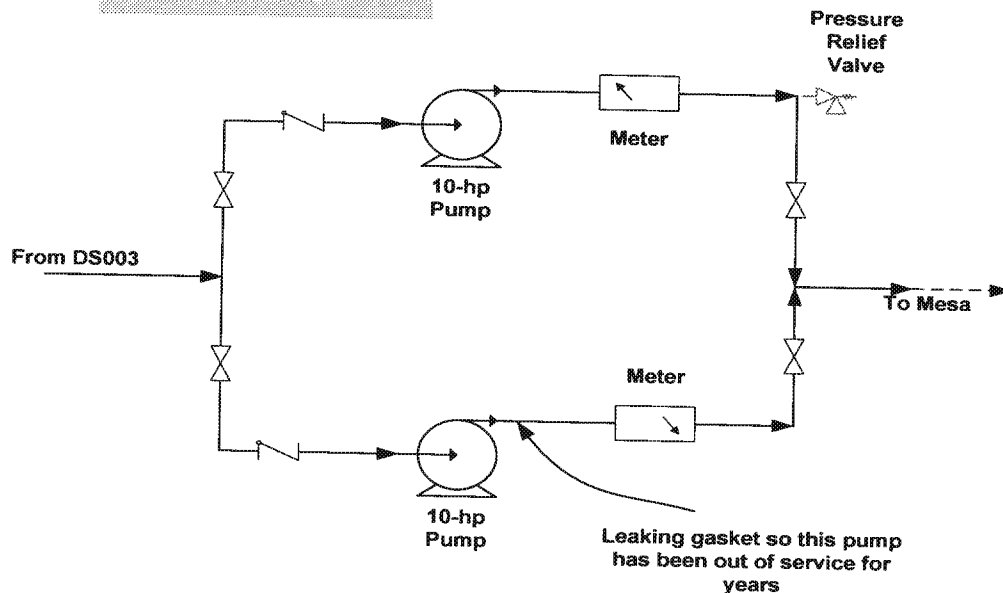
(example: "3 line shaft turbines")

Capacity 53 gpm against 482' of total dynamic head.

Controlled by One of the pumps has been out of service for years without correction. Apparently, it only needs a small and inexpensive part to stop a leak.
The operational pump runs on a timer which causes the tank on the mesa to overflow at times.

PF001

(no scale)



	Yes	No	Unk	N/A
Are pumps operable?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is redundancy provided?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Protected against trespass/vandalism?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Records maintained?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Property maintained?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Metered?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cross Connections eliminated?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
For booster stations:				
Does each pump have standard P-gage on discharge side?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Does each pump have compound gage on suction side?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
For boosters on suction lines directly connected to storage reservoirs, is there automatic cutoff for suction pressure ≤ 2.5 psi?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Comments: One pump is operable and one is not - thus the two first questions are marked yes and no. Like the rest of the system, this booster pumping facility shows signs of neglect. Only one pump has worked for years with little or no effort to correct the problem.

The static water pressures are currently 90 psig on the suction side of the pumps and 140 psig on the discharge side.

SANITARY SURVEY FORM - PUMPING FACILITIES (Other than Well Pumps)

Page 10 of 19

PWSID 0400106

SYSTEM NAME Polacca

WSF ID PF002

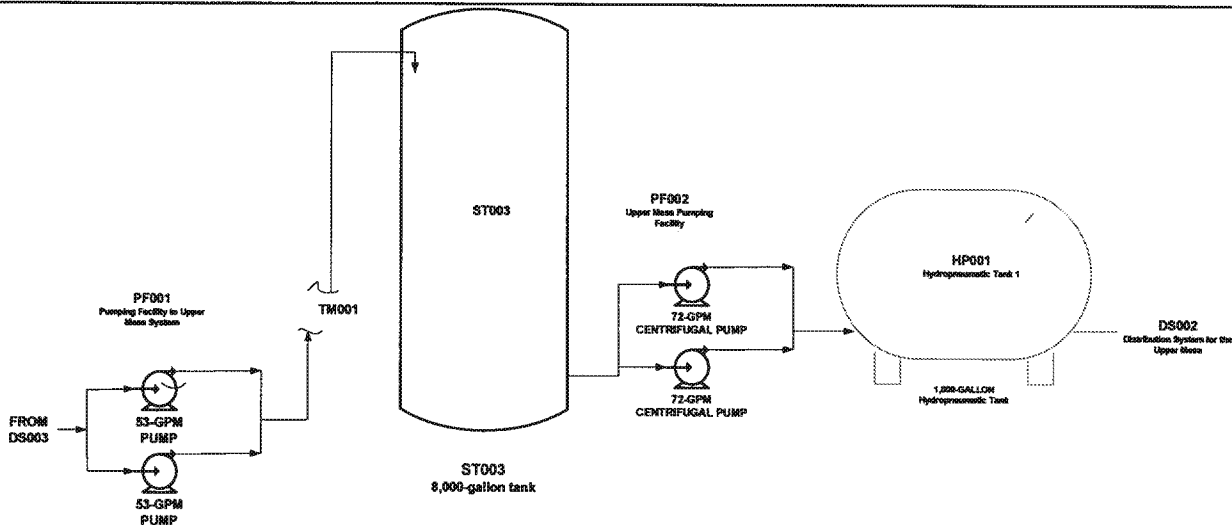
These are State assigned identification numbers

Number of Pumps Two

Type: Two end-suction 5-hp, 72-gpm booster pumps take suction from the 8,000-gallon welded steel storage tank and pressurize the mesa system.
(example: "3 line shaft turbines")

Capacity 72 gpm

Controlled by Contolled by pressure switch and the 1,000-gallon air/water interface hydropneumatic tank controls pump cycling.



	Yes	No	Unk	N/A
Are pumps operable?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is redundancy provided?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Protected against trespass/vandalism?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Records maintained?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Property maintained?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Metered?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cross Connections eliminated?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

For booster stations:

Does each pump have standard P-gage on discharge side? ☐ ☒ ☐ ☐

Does each pump have compound gage on suction side? ☐ ☒ ☐ ☐

For boosters on suction lines directly connected to storage reservoirs, is there automatic cutoff for suction pressure ≤ 2.5 psi? ☐ ☒ ☐ ☐

Comments: The facility is fairly secure because of its location where it is easily observed by many residents and it is in a building.

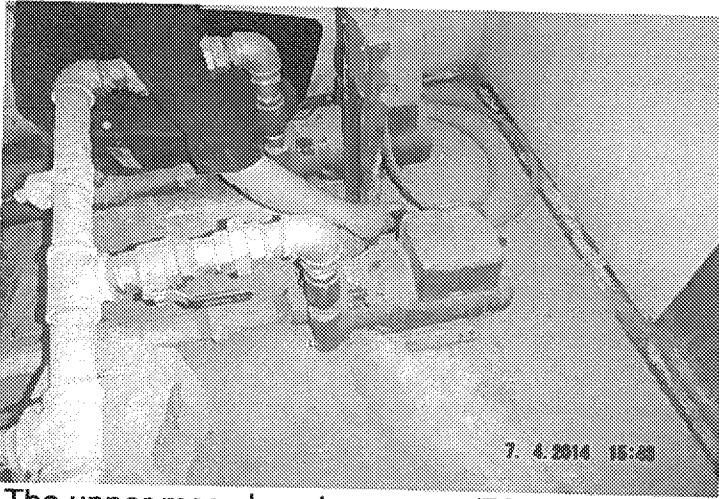
SANITARY SURVEY FORM - PRESSURE CONTROL ASSEMBLIES

Page 11 of 19

PWSID 0400106

SYSTEM NAME Polacca

PRESSURE TANK(S) (air/water interface)



The upper mesa booster pumps (PF002)

WSF ID HP001 Location, Description 1,000-gallon hydropneumatic tank to serve the upper mesa.

Yes No Unk N/A

Is there an operable pressure gauge? ☒ ☐ ☐ ☐

Does low pressure level provide adequate pressure? ☒ ☐ ☐ ☐

Pump run time Roughly 1 minute, 40 seconds – pumps off at 50 psi.

Time of day 2:00 PM

Is the tank operating properly (not water logged)? ☒ ☐ ☐ ☐

Is air charge system adequate? ☒ ☐ ☐ ☐

How much air is in the tank? ½ full of air (relatively high air content)

Is the exterior surface of the pressure tank in good physical condition? ☒ ☐ ☐ ☐

Is there a water level sight glass? ☒ ☐ ☐ ☐

Is there a bottom drain valve? ☒ ☐ ☐ ☐

Is there a pressure relief valve? ☒ ☐ ☐ ☐

Can tank(s) be by-passed for repair? ☐ ☒ ☐ ☐

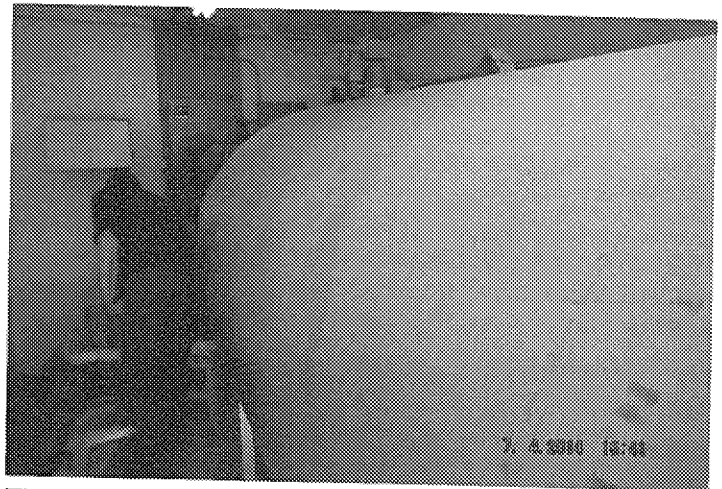
Pump type: 5-hp pumps

Comments: 2 booster pumps. Based on run time and reported pump capacity, only 120 gallons of the tank's capacity is being used. Observation of the sight gauge confirms this and it seems inefficient. Also, pumps of this size generally should run more than 2 minutes when they come on (this is a rule of thumb – not necessarily something that is true in all cases).

PRESSURE TANK(S) (air/water interface)



The hydropneumatic tank's (HP001) sight gauge.



The air/water interface hydropneumatic tank (HP001)

SANITARY SURVEY FORM - TREATMENT

Page 12 of 19

PWSID 0400106

SYSTEM NAME Polacca

Treatment Objective

B = Disinfection Byproduct Control
 C = Corrosion Control
 D = Disinfection
 E = Dechlorination
 F = Iron Removal
 I = Inorganics Removal
 M = Manganese Removal
 N =

WATER TREATMENT FACILITIES

WSF ID Treatment Plant Name

Treatment Objective and Code

TP001 Chlorination Unit for Wells 5 & 6

D421

TP002 Chlorination Unit for Well 8

D421

See previous diagrams of treatment plants and well house piping.

Treatment Description / Comments: Diaphragm metering pumps in each well house inject chlorine solution into the water stream. The chlorine is injected into TP001 for GW002 and GW003. The LMI pumps are over-sized and are operating at ranges of stroke and speed that are too low for accuracy. At TP002, both the well and metering pump have to be started manually because the flow switch has been destroyed by a leak in the chlorine injection line (see the photo below).

FOR SYSTEMS EMPLOYING FULL-TIME DISINFECTION

What disinfectant is used? 12.5% sodium hypochlorite solution. Yes No Unk N/A

Is the disinfectant used NSF approved? ☒ ☐ ☐ ☐

Is the amount of disinfectant used recorded? ☒ ☐ ☐ ☐
 If Yes, amount used: _____ lbs/day X ppm _____ other (give units)

Is the amount of disinfectant used compared to water pumped to verify concentration? ☐ ☒ ☐ ☐

Is chemical storage adequate and safe? ☒ ☐ ☐ ☐
 If No, explain _____

Is disinfectant residual being monitored daily? ☐ ☒ ☐ ☐

Are residual reports submitted monthly? ☒ ☐ ☐ ☐

Is the disinfection equipment being operated and maintained properly? ☒ ☐ ☐ ☐

Is operational standby equipment provided? ☐ ☒ ☐ ☐

If not, are critical spare parts on hand? ☐ ☒ ☐ ☐

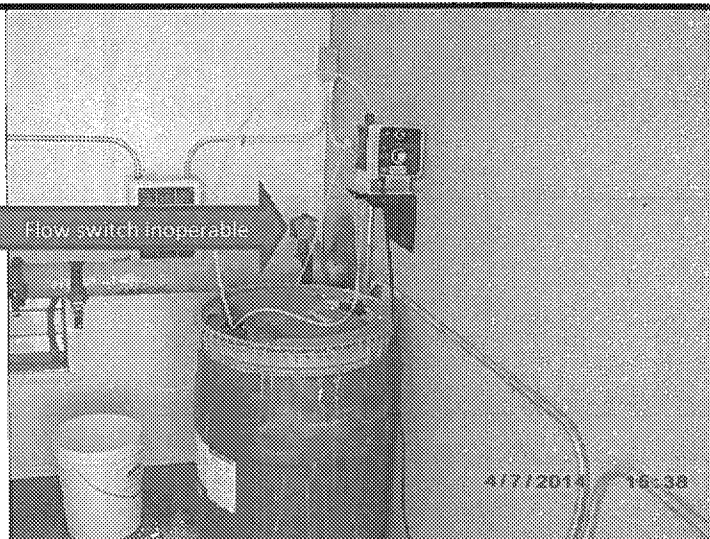
Has disinfection system been free from failure during the past year – no interruption? ☐ ☒ ☐ ☐

If No, give dates of interruptions Unk
 CT available No detailed drawings to determine the available contact
 time, minutes _____ mg/L _____ mg/min/L

Residual ☒ Free ☐ Combined

Describe provisions for providing contact time between disinfection point and the first point of use: time in the mains for TP001. TM001 for TP002

Measured chlorine residual: 0.4 mg/L Location(s): Offices



FOR LIQUID HYPOCHLORINATION

Pump model: LMI
 Settings: Stroke 20 and 12%
Speed 20 and 20%
 Vat Size: 50 gallons
 Solution Strength: 12.5%

Comments: The oversized pumps are operating in a range where they are less dependable in terms of injecting the amount the curves would lead you to believe. Also, the low frequency of injection leads to poor mixing of the chemical with the water.

SANITARY SURVEY FORM - STORAGE

Page 13 of 19

PWSID 0400106

SYSTEM NAME Polacca

How much TOTAL treated storage is provided? 708,000 gallons Is all treated water covered? ☒ Yes ☐ No
 Total number of days of supply? Roughly 5 days assuming an average of 50 gallons per capita per day (domestic use only).

Comments: _____

STORAGE FACILITY

WSF ID ST001 Location, Description West Side of PolaccaStorage Volume? 200,000 gallonsDimensions: 30' D, 40' H (~38' to overflow)Year constructed: 1977Material: ☐ Bolted steel: ☒ Welded steel ☐ Concrete ☐ Other

	Yes	No	Unk	N/A
Does surface runoff and underground drainage drain away?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the site protected against flooding?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the site protected against trespass/vandalism?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is tank inspected every 5 years by a structural engineer for structural integrity?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Date of last inspection

By whom

Condition: ☐ Good ☐ Fair ☒ PoorDescribe piping (e.g. floats on line): Floats on the lineFoundation: ☐ Slab ☒ Ring ☐ Other

Ladders caged and locked? ☒ ☐ ☐ ☐
 Ladder material: Steel
 Internal ladder? Steel

Are overflow lines, air vents, drainage lines or clean out pipes turned downward or covered, screened and terminated a minimum of 3 diameters above the ground or storage tank surface? ☐ ☒ ☐ ☐

Overflow pad? ☐ ☒ ☐ ☐

Erosion? ☒ ☐ ☐ ☐

Working and accurate target? ☒ ☐ ☐ ☐

Is access hatch sealed properly and locked? ☐ ☒ ☐ ☐

Are surface coatings in contact with water ANSI / NSF approved? ☐ ☐ ☒ ☐

Is tank protected against icing and corrosion? ☐ ☒ ☐ ☐

Can tank be isolated from system? ☒ ☐ ☐ ☐

Is all treated water storage covered? ☒ ☐ ☐ ☐

What is cleaning frequency for tanks? Unk

Are tanks disinfected after repairs are made? ☒ ☐ ☐ ☐

Comments: The tank should be cleaned and recoated. Opening in surrounding fence needs to be repaired. The vent is screened but the screen mesh size is too large to exclude insects. The hatch cover needs a new gasket. Lots of erosion at the overflow due to manual operation.

(Include safety and security concerns)

STORAGE FACILITY

WSF ID ST002 Location, Description NE side of PolaccaStorage Volume? 500,000 gallonsDimensions: 60' D, 24' HYear constructed: 1998Material: ☐ Bolted steel: ☒ Welded steel ☐ Concrete ☐ Other

	Yes	No	Unk	N/A
Does surface runoff and underground drainage drain away?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the site protected against flooding?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the site protected against trespass/vandalism?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Condition: ☐ Good ☒ Fair ☐ PoorDescribe piping (e.g. floats on line): InlineFoundation: ☐ Slab ☒ Ring ☐ Other

Ladders caged and locked? ☒ ☐ ☐ ☐

Ladder material: SteelInternal ladder? Steel

Are overflow lines, air vents, drainage lines or clean out pipes turned downward or covered, screened and terminated a minimum of 3 diameters above the ground or storage tank surface? ☒ ☐ ☐ ☐

Overflow pad? ☐ ☒ ☐ ☐

Erosion? ☒ ☐ ☐ ☐

Working and accurate target? ☒ ☐ ☐ ☐

Is access hatch sealed properly and locked? ☐ ☒ ☐ ☐

Are surface coatings in contact with water ANSI / NSF approved? ☒ ☐ ☐ ☐

Is tank protected against icing and corrosion? ☐ ☒ ☐ ☐

Can tank be isolated from system? ☒ ☐ ☐ ☐

Is all treated water storage covered? ☒ ☐ ☐ ☐

What is cleaning frequency for tanks? Unk

Date tank was last cleaned? Probably never.

Are tanks disinfected after repairs are made? ☐ ☐ ☒ ☐

Comments: Overflow outlet is screened. Lots of erosion at overflow outlet due to overflows. The hatch cover needs to have its gasket replaced. The tank is due for a professional inspection and some re-coating.

(Include safety and security concerns)

SANITARY SURVEY FORM - STORAGE

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PWSID 0400106

SYSTEM NAME Polacca

How much TOTAL treated storage is provided? 708,000 gallons Is all treated water covered? ☒ Yes ☐ No
 Total number of days of supply? Roughly 5 days assuming an average of 50 gallons per capita per day (domestic use only).

Comments:

STORAGE FACILITY

WSF ID ST003 Location, Description On the upper mesa
 Storage Volume? 8,000 gallons
 Dimensions: 9' D; 14.5' H (Probably closer to 6,900 gallons actual)
 Year constructed: Unk, but old and in bad shape.
 Material: ☐ Bolted steel ☒ Welded steel ☐ Concrete ☐ Other

Yes No Unk N/A

Does surface runoff and underground drainage drain away? ☒ ☐ ☐ ☐

Is the site protected against flooding? ☒ ☐ ☐ ☐

Is the site protected against trespass/vandalism? ☐ ☒ ☐ ☐

Is tank inspected every 5 years by a structural engineer for structural integrity? ☐ ☒ ☐ ☐

Condition: ☐ Good ☐ Fair ☒ Poor

Describe piping (e.g. floats on line): Inline

Foundation: ☐ Slab ☐ Ring ☒ Other

Ladders caged and locked? ☐ ☒ ☐ ☐

Ladder material: None

Internal ladder? None

Are overflow lines, air vents, drainage lines or clean out pipes turned downward or covered, screened and terminated a minimum of 3 diameters above the ground or storage tank surface? ☐ ☒ ☐ ☐

Overflow pad? ☐ ☒ ☐ ☐

Erosion? ☐ ☐ ☒ ☐

Target working and accurate target? ☐ ☒ ☐ ☐

Is access hatch sealed properly and locked? ☐ ☒ ☐ ☐

Are surface coatings in contact with water ANSI / NSF approved? ☐ ☐ ☒ ☐

Is tank protected against icing and corrosion? ☐ ☒ ☐ ☐

Can tank be isolated from system? ☐ ☒ ☐ ☐

Is all treated water storage covered? ☒ ☐ ☐ ☐

What is cleaning frequency for tanks? Unk

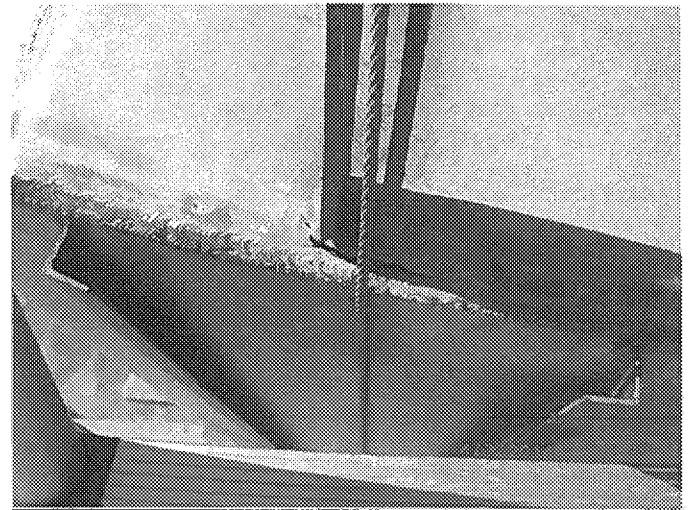
Are tanks disinfected after repairs are made? ☒ ☐ ☐ ☐

Comments: The mesa tank has not been cleaned for a long time. It is in poor condition and is leaking at its base. A cursory investigation would lead one to believe that replacement of the tank is in order. Pumping to the tank from the distribution system is manually controlled and leads to overflowing water regularly and running out of water occasionally. The latter problem subjects the upper mesa distribution system to pressure loss and risk of contamination. The tank is to be replaced in 2014.

(Include safety and security concerns)



Leak and corrosion of tank.



The roof of the tank is corroded and there are openings to allow contamination to enter the stored drinking water.

The two photos above are nearly identical to the two included in the 2010 sanitary survey report. No attempt has been made to correct these deficiencies. Clearly, the tank needs to be replaced; however, with just a little effort, improvements could be made to correct these kinds of sanitary deficiencies. Simple addition of silicone caulking would keep insects and dust from entering the tank through the openings shown in the lower photo.

SANITARY SURVEY FORM - MISCELLANEOUS

Page 15 of 19

PWSID 0400106

SYSTEM NAME Polacca

DISTRIBUTION SYSTEM EVALUATION

System description The distribution system has been upgraded over the years. For example, in 2000-3, 8 & 10-inch diameter AWWA C-900 PVC mains were installed in place of old AC. Most of the newer mains are PVC (probably not all C-900), still AC, some ductile iron and some polyethylene.

Feet of mains? UnkCondition of mains? UnkDate of installation of mains? Some at least 50 years old and some from 2000-3System drawings available? ☒ Yes ☐ No ☐ Unk ☐ N/AAs-built drawings? ☒ Yes ☐ No ☐ Unk ☐ N/ADate As builts are not completely accurate.Drawing on-site? ☐ Yes ☒ No ☐ Unk ☐ N/ALines adequately sized? ☒ Yes ☐ No ☐ Unk ☐ N/AAdequate pressure maintained? ☒ Yes ☐ No ☐ Unk ☐ N/AMains protected from freezing? ☐ Yes ☒ No ☐ Unk ☐ N/ADistribution system free of leaks? ☐ Yes ☒ No ☐ Unk ☐ N/AFire hydrants? ☒ Yes ☐ No ☐ Unk ☐ N/ADead end lines eliminated? ☐ Yes ☒ No ☐ Unk ☐ N/AFlushing program? ☐ Yes ☐ No ☒ Unk ☐ N/APressure reducing stations? ☒ Yes ☐ No ☐ Unk ☐ N/A
Number 9Booster stations? Number 2 ☒ Yes ☐ No ☐ Unk ☐ N/AConnections to other PWSs? ☐ Yes ☒ No ☐ Unk ☐ N/A

If Yes, please describe: _____

Check one: ☐ No cross-connections were observed.☒ Cross-connections were observed. Describe below.

Comments: Health facility is not properly separated with BFPs. The IHS has as-built. The mesa tank overflow line and inlet line are above grade and are not protected from freezing.

The IHS has the system's drawings on Autocad and in PDF format. The drawings are not 100% accurate per IHS. There are mains that have been abandoned but are still charged with water. This offers another potential risk of contamination.

The current transmission main to the upper mesa will be abandoned but the existing pumping facility will remain online. There are plans to install an HDPE transmission line beside the road to the mesa and the above grade lines will be abandoned. The 8,000-gallon mesa tank is to be replaced too.

MONITORING AND RECORDKEEPING EVALUATION

Yes No Unk N/A

Bacti monitoring satisfactory? ☐ Yes ☐ No ☒ Unk ☐ N/AFamiliar with repeat sampling? ☒ Yes ☐ No ☐ Unk ☐ N/ABacti records kept appropriately? (5 years) ☒ Yes ☐ No ☐ Unk ☐ N/ABacti Sample Site Plan submitted? ☐ Yes ☐ No ☒ Unk ☐ N/AWhere are chem./rad samples collected? At the entry points.Chemical monitoring records maintained? (10 years) ☒ Yes ☐ No ☐ Unk ☐ N/ADid Surveyor take a bacteriological sample? ☐ Yes ☒ No

Other Records

Disinfection Profile (if required)? ☒ N/A ☐ Yes ☐ NoStage 1 Monitoring plan? ☐ N/A ☒ UnkSanitary surveys? ☒ Unk ☐ Yes ☐ NoOther? NA ☐ Yes ☐ NoIn compliance with Lead and Copper Rule ☒ UNK ☐ Yes ☐ NoLead and Copper Rule monitoring plan ☒ UNK ☐ Yes ☐ No

Records for monitoring and monitoring plans for coliforms, lead and copper and disinfection byproducts were not provided to the surveyors.

SANITARY SURVEY FORM - MISCELLANEOUS

Page 16 of 19

PWSID: 0400106

SYSTEM NAME: Polacca

SAFETY

Check one: ☐ No confined spaces were observed.
☒ Confined space(s) were observed.

Describe any confined spaces observed Tanks and PRV vaults

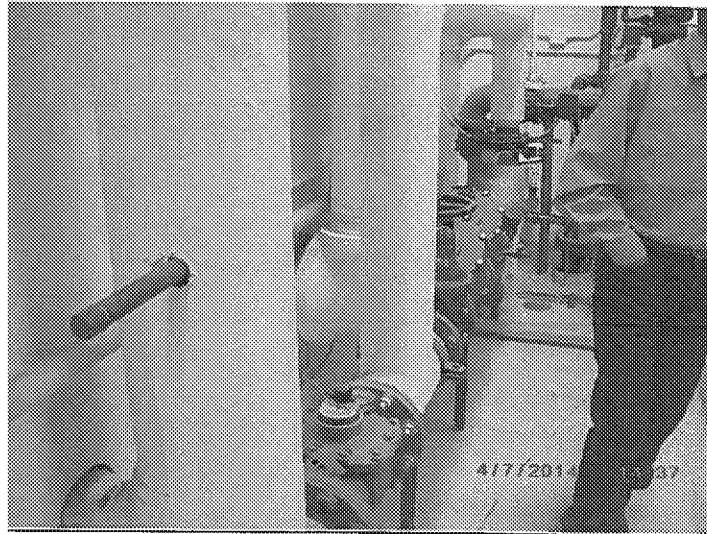
Check one: ☐ No fall risks were observed.
☒ Fall risks were observed.

Describe any fall risks observed TANKS

Note any other safety deficiencies (consider items such as ladders, tank supports, guards on rotating electrical equipment, wiring problems, etc.)

Some service lines are protected with backflow prevention assemblies. However, the ones looked at during the survey (at the health facility) have not been tested as required and the main service line has an unprotected bypass on the service line's backflow preventer. There are likely other facilities served by the PWS that have, or should have, backflow preventers that should be tested annually. The PWS needs to make sure the testing is done and, when necessary, repairs or replacements made.

The system needs to identify and locate all backflow preventers and see that they are tested on an annual basis by a certified tester.



The backflow preventer on the IHS health center is only a double gate, double check and it has an unprotected bypass.

MANAGEMENT

Administrative Board – Name and description There is an enterprise board for the consolidated villages with Ivan Sidney as business manager.

Training provided – Describe No certified operators at this time.

	Yes	No	Unk	N/A
By-laws or articles of incorporation?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Year of enactment: _____				
Are copies available?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Budget:				
Exists?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Adequate?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tribally subsidized?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are personnel adequately trained?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are operators properly certified?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are there sufficient personnel?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is an emergency plan available and workable?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are abandoned wells present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do abandoned wells appear to be properly abandoned?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Is operator aware of procedures regarding well abandonment?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Is there an O&M manual?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is it current?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Is a copy on-site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Does the system have a current Monitoring Schedule?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
O&M log maintained?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Comments: Management needs to make sure the system is properly operated and maintained.

At the time of the last sanitary survey, SGEC was assured that the system's management and staff were working to get the facilities back in decent shape and make the PWS self-supporting. This obviously has not happened. Even the easy to correct deficiencies have not been addressed.

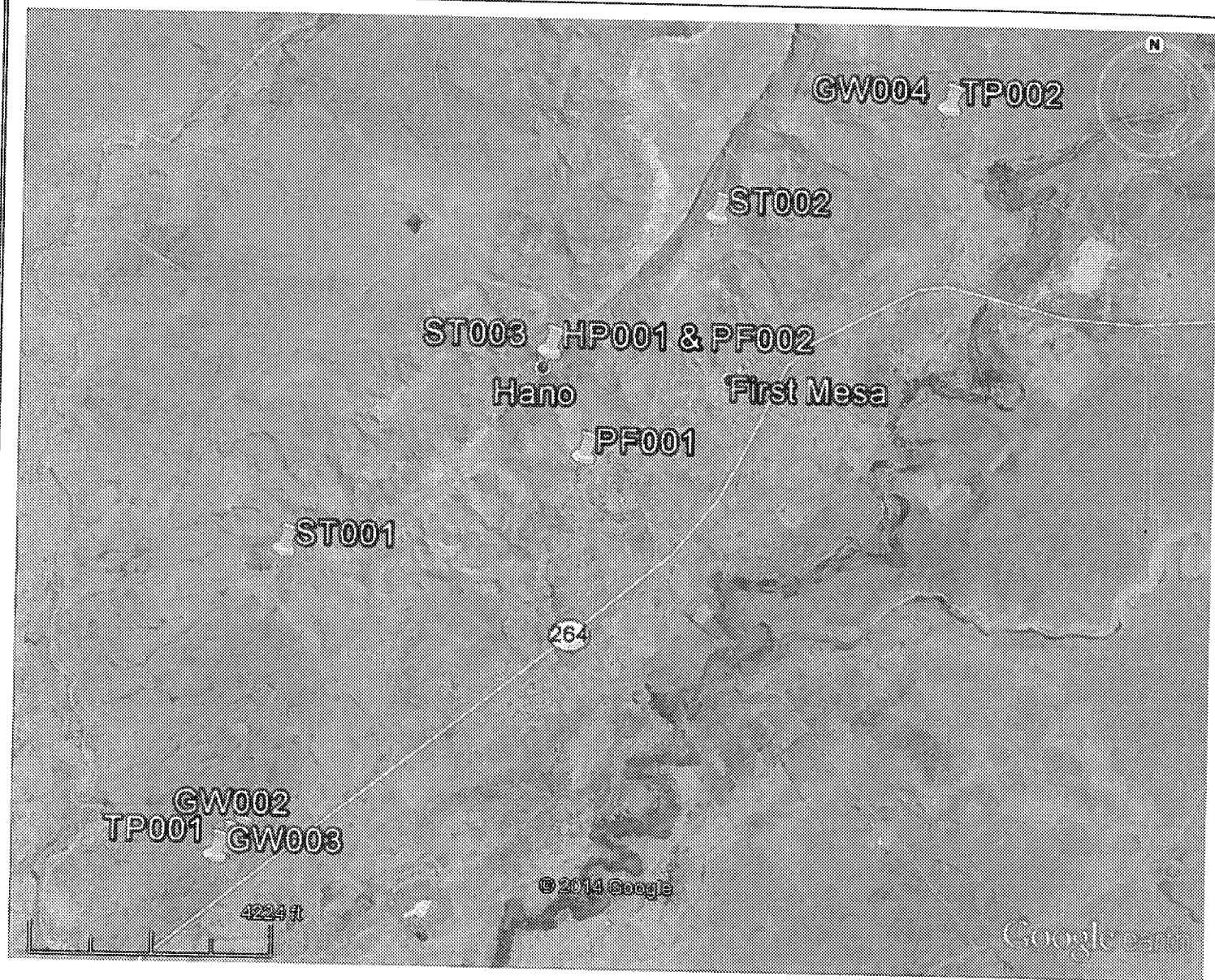
SANITARY SURVEY FORM – AERIAL PHOTOS

Page 17 of 19

PWSID 0400106

SYSTEM NAME Polacca

Aerial Photograph



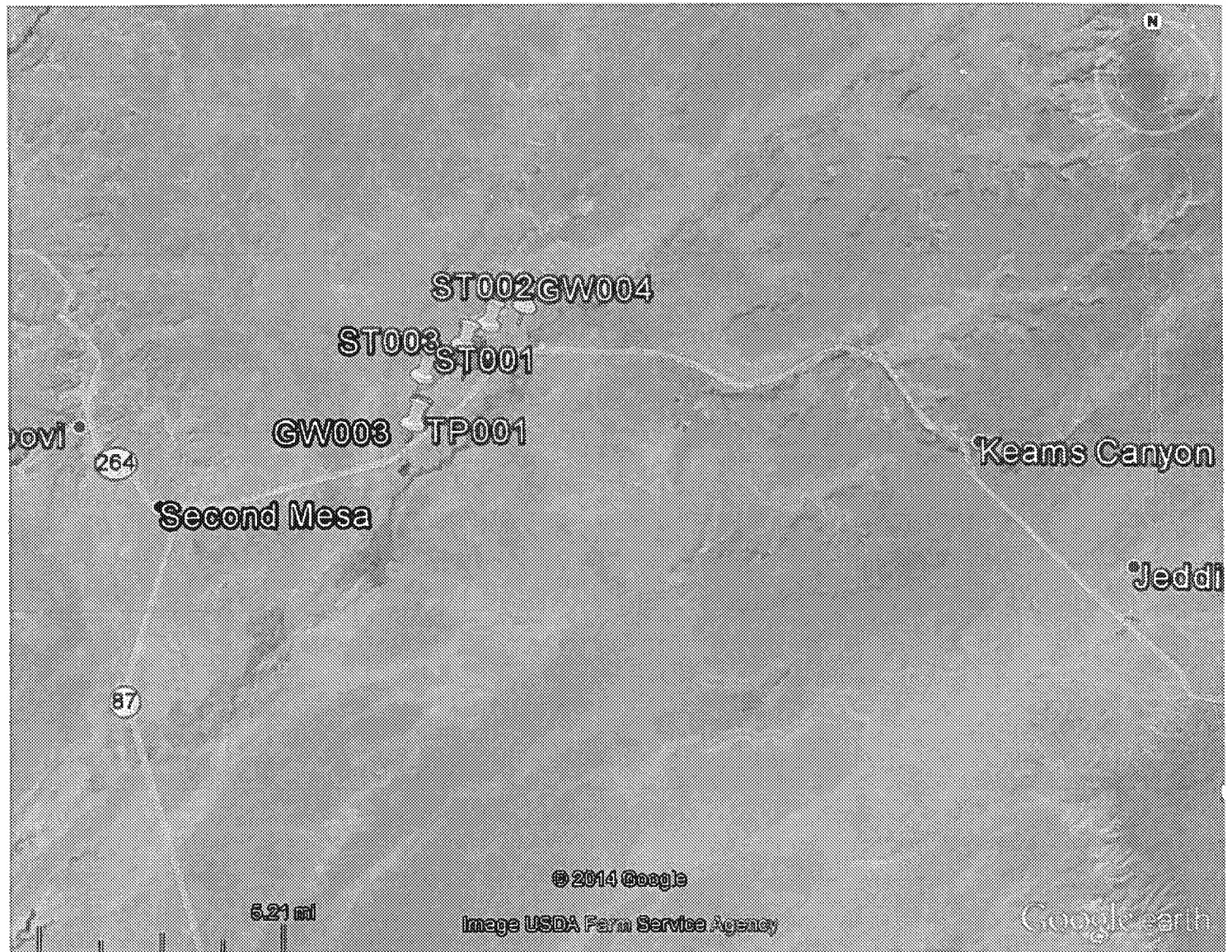
SANITARY SURVEY FORM – AERIAL PHOTOS

Page 18 of 19

PWSID 0400106

SYSTEM NAME Polacca

Aerial Photograph



SANITARY SURVEY FORM – AERIAL PHOTOS

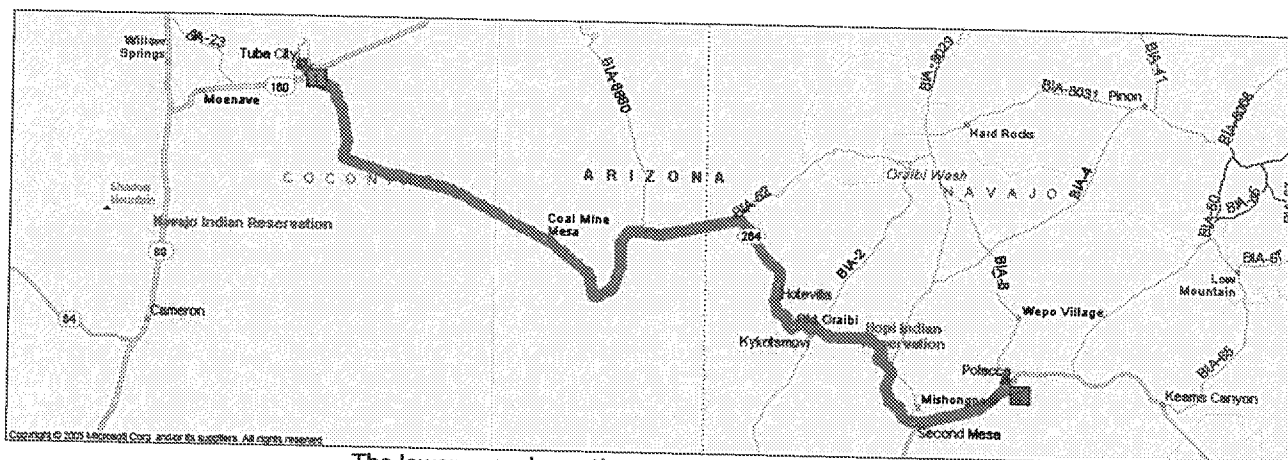
Page 19 of 19

PWSID 0400106

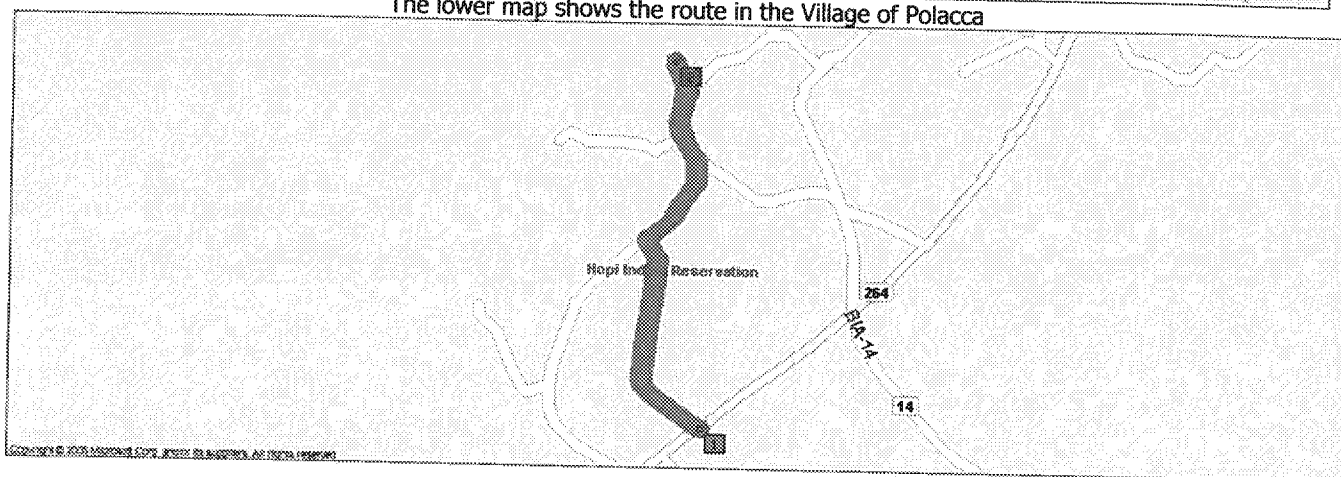
SYSTEM NAME Polacca

MAP

	Instruction
9:00 AM 0.0	1 Depart Tuba City on BIA-101 [Main St] (South-East) for 0.6 mi
9:00 AM 0.6	Road name changes to SR-264 [Main St] for 69.1 mi
10:11 AM 69.7	Turn LEFT (North-West) onto Local road(s) for 0.3 mi
10:12 AM 70.0	Turn RIGHT (North-East) onto Local road(s) for 0.1 mi
10:12 AM 70.1	Bear LEFT (North) onto Local road(s) for 0.1 mi
10:12 AM 70.2	Turn LEFT (North) onto Local road(s) for 76 yds
10:13 AM 70.3	2 Arrive 35.83236°N 110.38993°W (POLACCA PWS'S OFFICES)



The lower map shows the route in the Village of Polacca



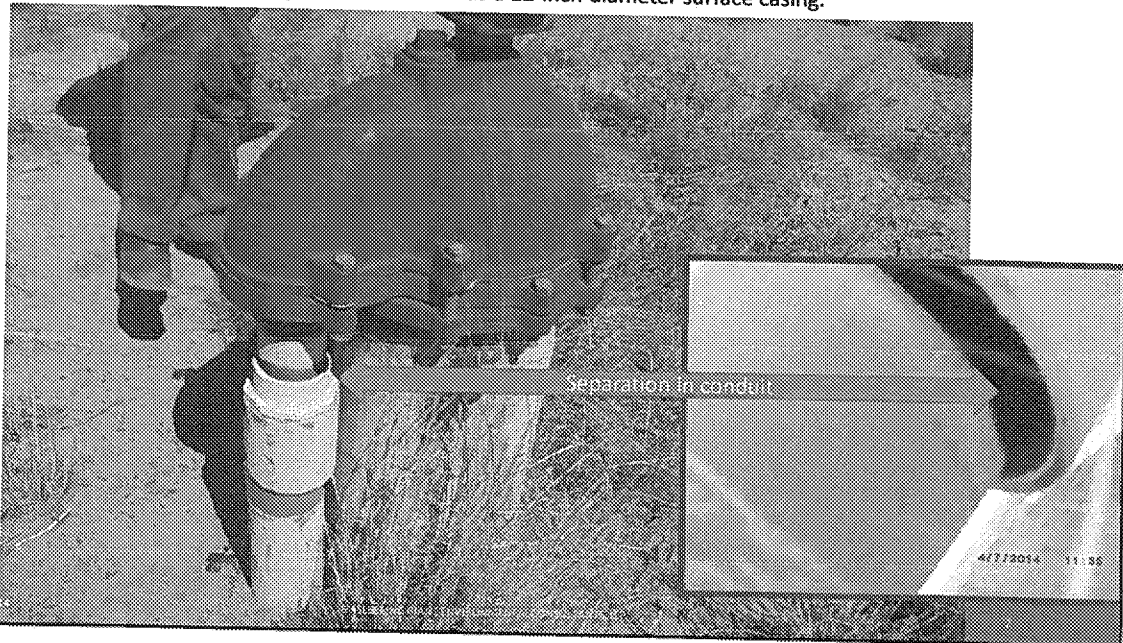
Top map and driving instructions are from Tuba City to the Polacca Village offices (by the post office) – the bottom map shows an enlarged portion of the map from a point where you leave route 264 and find your way to the offices which are located by the post office. The offices are also near the pumping facility that takes water from the distribution system and pumps it to the upper mesa.

III. Photographs

Sanitary Survey of Polacca Public Water System PWSID #0400106

APRIL 7, 2014

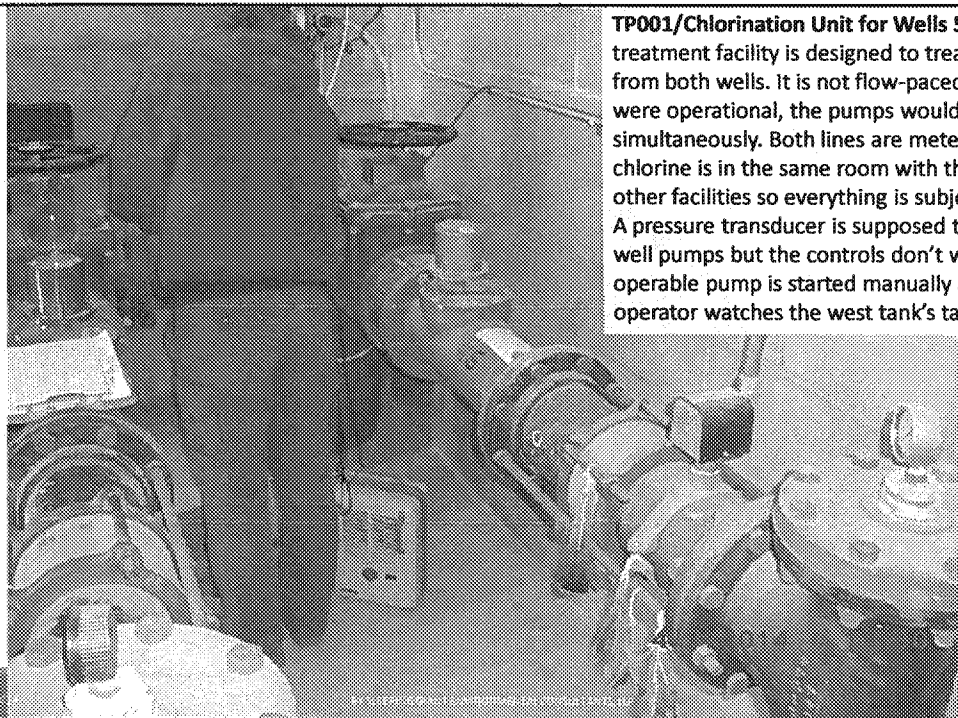
GW002/West Well 6: This well is the only one in service on the west side of the PWS. It produces about 130 gpm. The sanitary seal is vented and screened but the conduit is separated. The opening offers opportunities for insects, spiders and dust to enter the casing. The well does not have a security fence. The well has a 12-inch diameter surface casing.



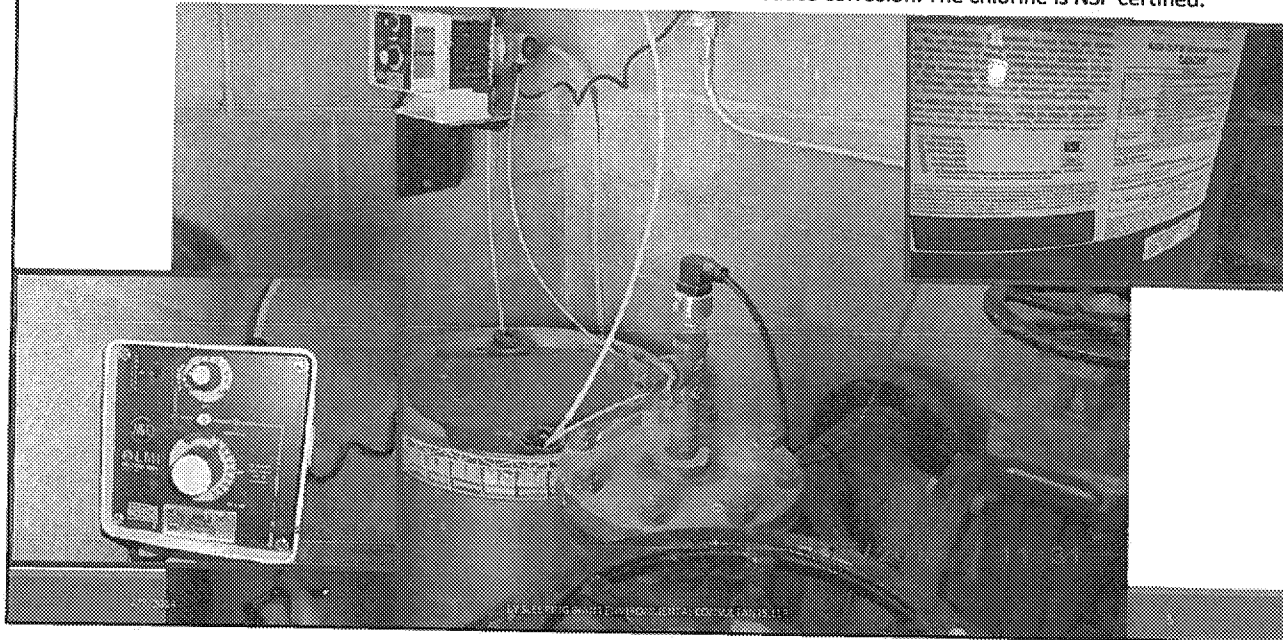
GW003/West Well 5: This well also has a 12-inch diameter surface casing. It has been offline for years. It reportedly has a new pump but doesn't produce water. There appears to be disagreement about the cause of the problem and apparently not a lot of interest in figuring it out and making corrections. The area around the casing is poorly graded offering an opportunity for water to pool and migrate down the casing



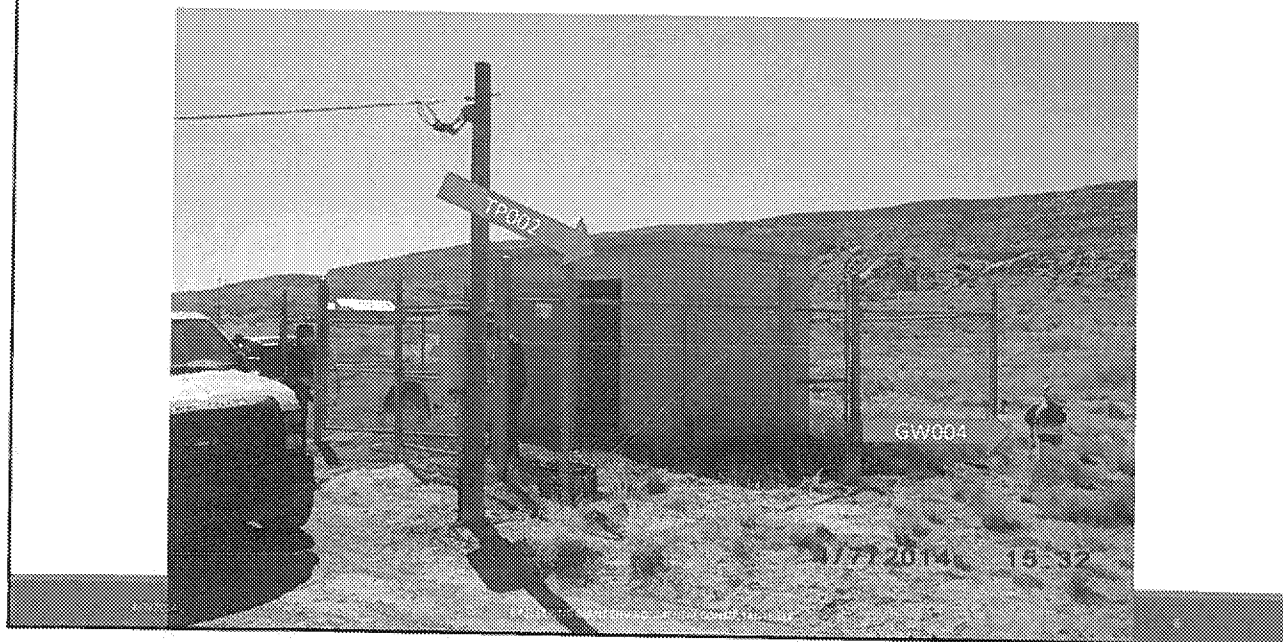
TP001/Chlorination Unit for Wells 5 and 6: This treatment facility is designed to treat the water from both wells. It is not flow-paced so if both wells were operational, the pumps would have to run simultaneously. Both lines are metered. The chlorine is in the same room with the controls and other facilities so everything is subject to corrosion. A pressure transducer is supposed to control the well pumps but the controls don't work so the operable pump is started manually and the operator watches the west tank's target.



TP001/Chlorination Unit for Wells 5 and 6: The LMI metering pump is set at 20% stroke and 20% speed. This would lead one to believe it is oversized or the chlorine solution should be diluted. The pumps should run in their midrange to function best (per Milton Roy). The vat of chlorine is not sealed and vented to the exterior to reduce corrosion. The chlorine is NSF-certified.



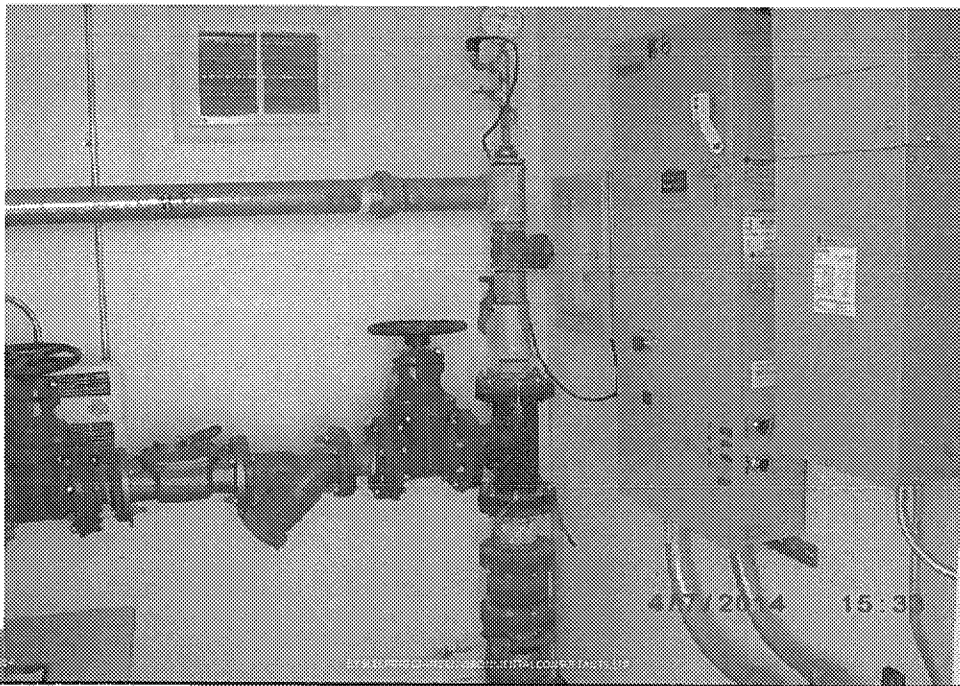
GW004/East Well 8 & TP002/Chlorination for Well 8: This well was producing 92 gpm at the time of the survey. It too is operated manually. The automation doesn't work and the timer doesn't work. The well does not have the protection of a security fence.



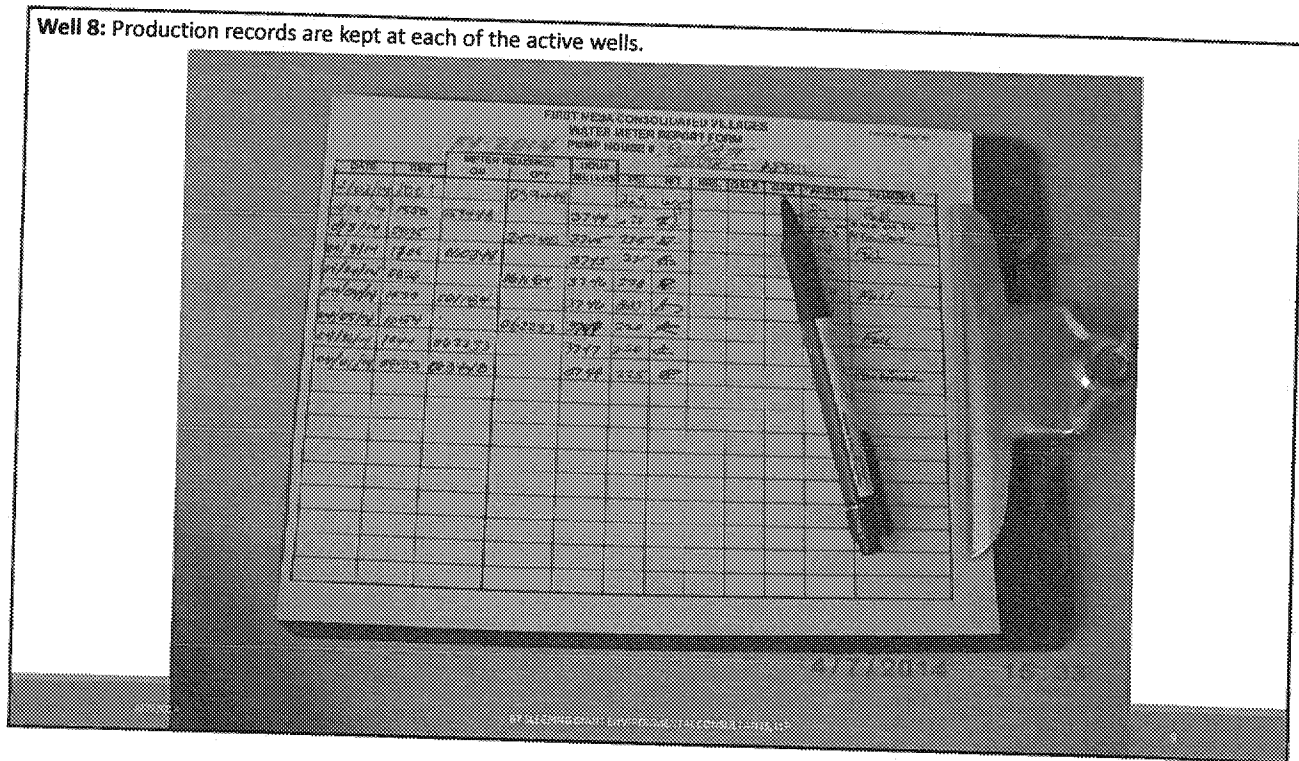
GW004/East Well 8: The casing has a vented sanitary seal. The water enters the first room of the building where it is metered. It flows to the second room where chlorine is injected for disinfection.



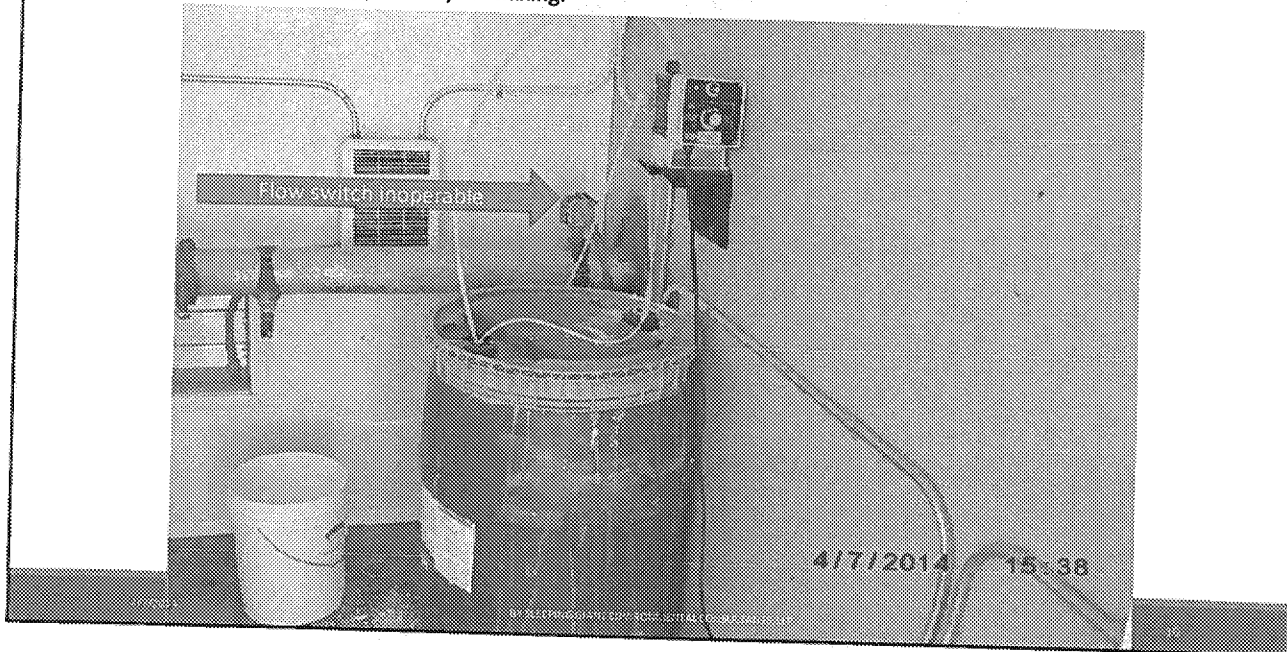
Metering of Well 8: Metering occurs here, the pressure transducer and timer are not functional.



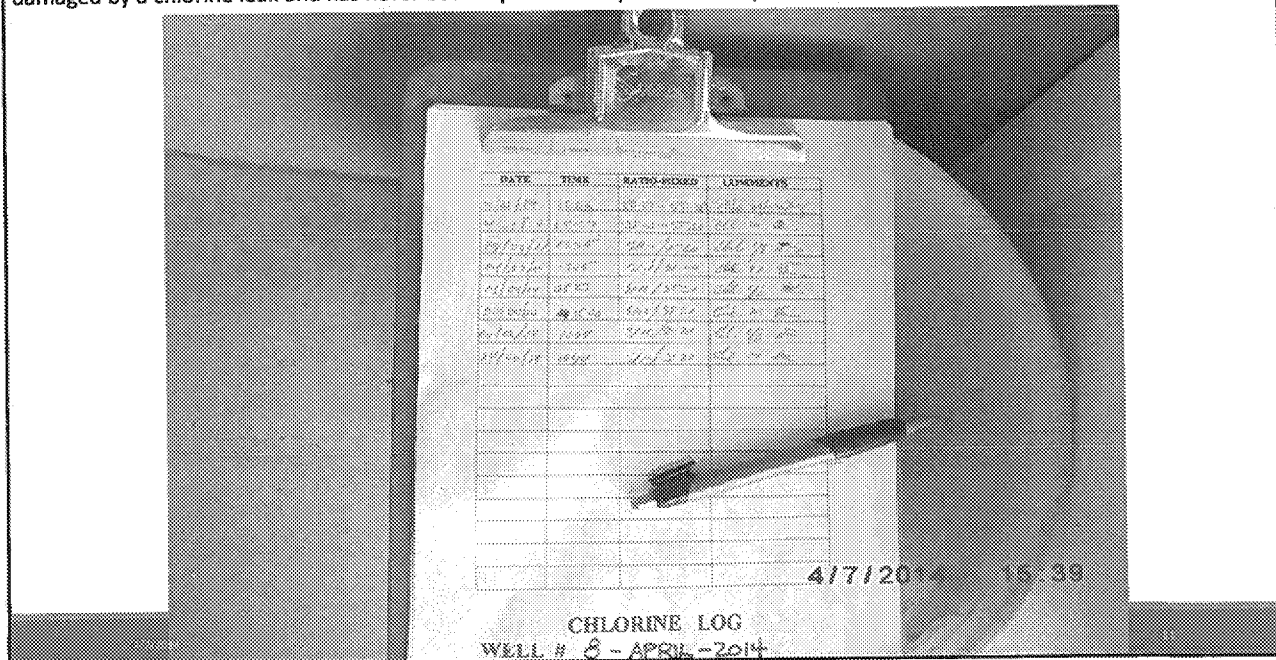
Well 8: Production records are kept at each of the active wells.



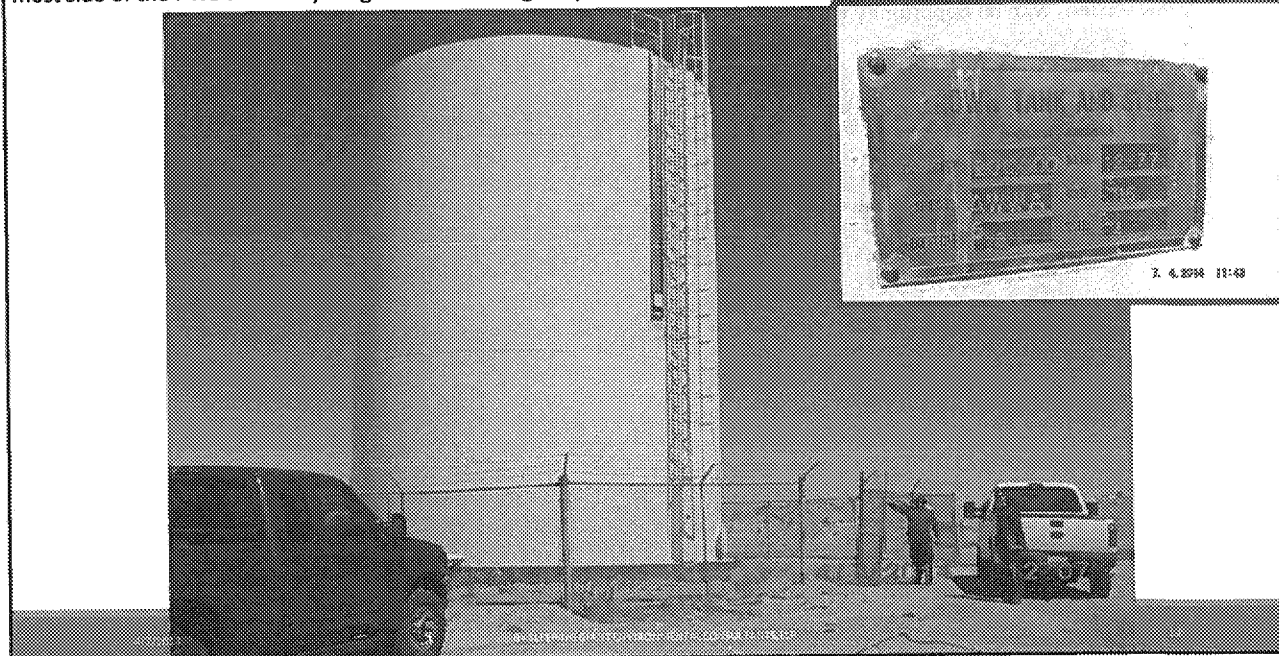
Chlorination for Well 8: The chlorine is injected with an LMI pump with the speed at 20% and the stroke at 12%. Again, the pump is over-sized unless the chlorine solution is diluted. As it was operating during the survey, a slug of chlorine was injected into the line every few seconds with no opportunity for mixing.



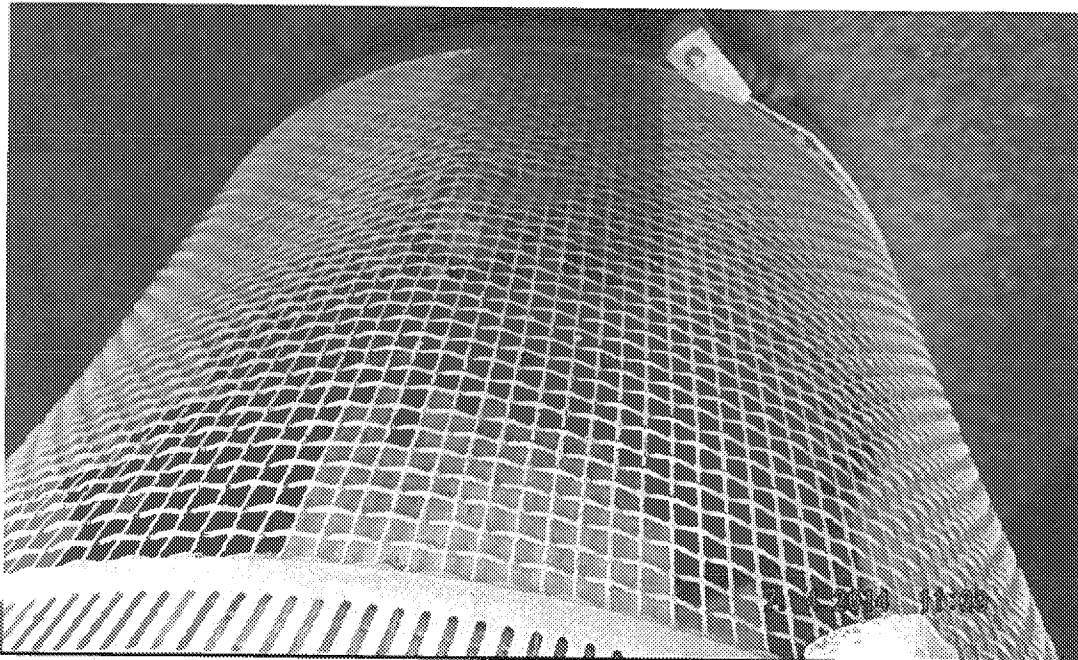
GW004/East Well 8 & TP002/Chlorination for Well 8: The chlorinator also has to be turned on manually. The flow switch was damaged by a chlorine leak and has never been replaced. The photo is the operator's records regarding the disinfection system.



ST001/Older West Storage Tank: This is a 200,000-gallon welded steel storage tank. It almost exclusively serves the western-most side of the PWS and everything south of the highway. The tank shows obvious signs of long term neglect.



ST001/Older West Storage Tank: The vent is screened but the mesh is too large to exclude insects. This screen should be covered with a non-corrodible insect screen.



ST001/Older West Storage Tank: Note the corrosion and that the hatch cover gasket has not been replaced for years.

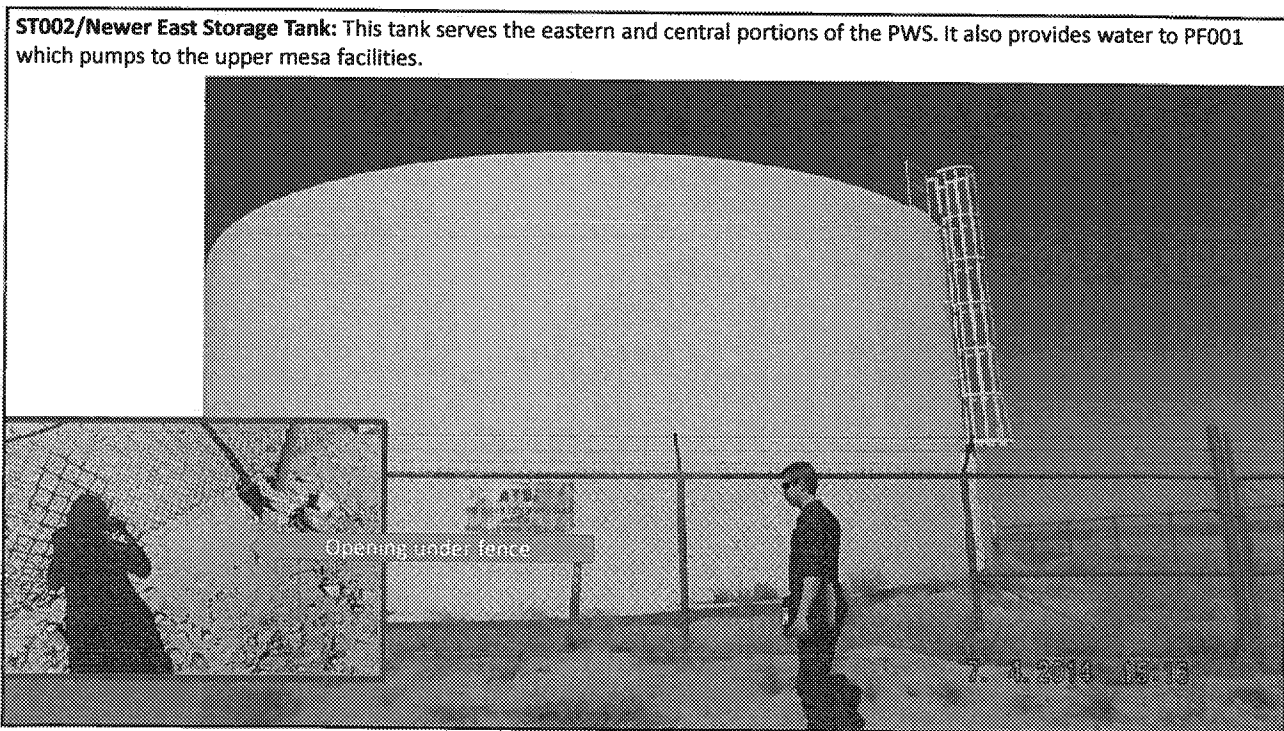
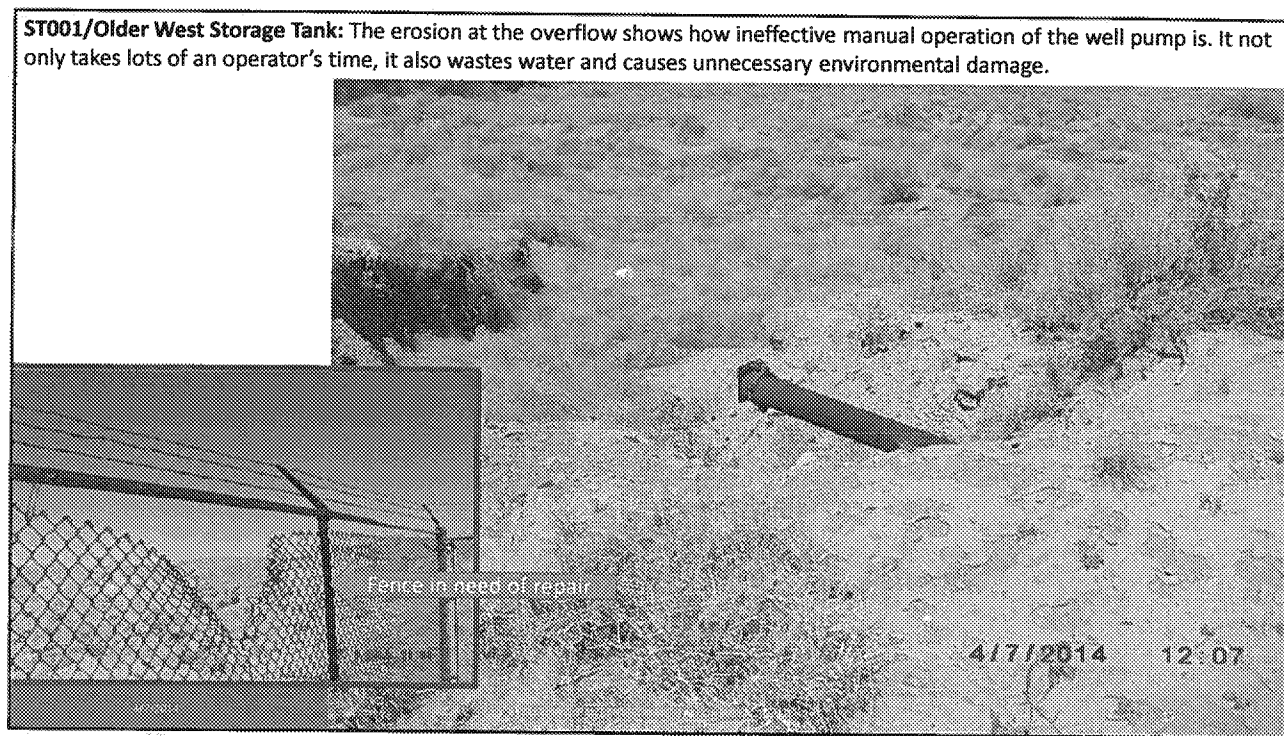


ST001/Older West Storage Tank: Additional signs of long term neglect.

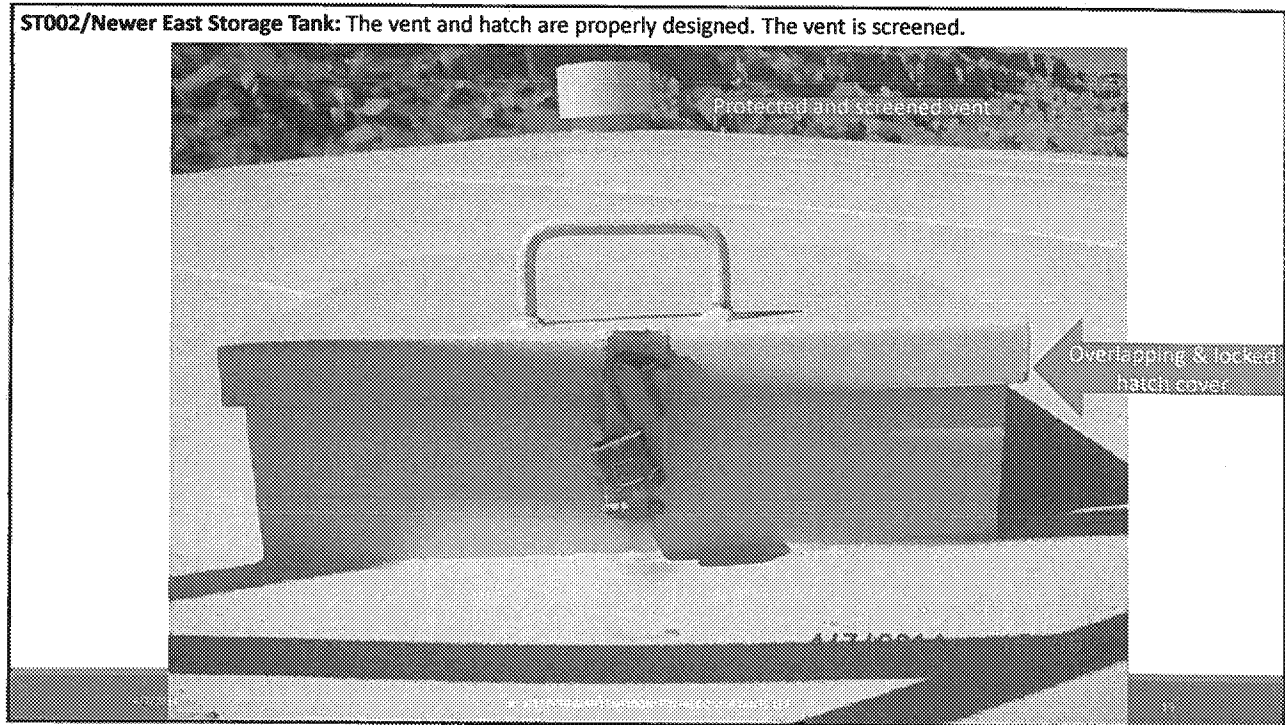


ST001/Older West Storage Tank: The tank needs immediate attention. It should be taken offline and rehabilitated.

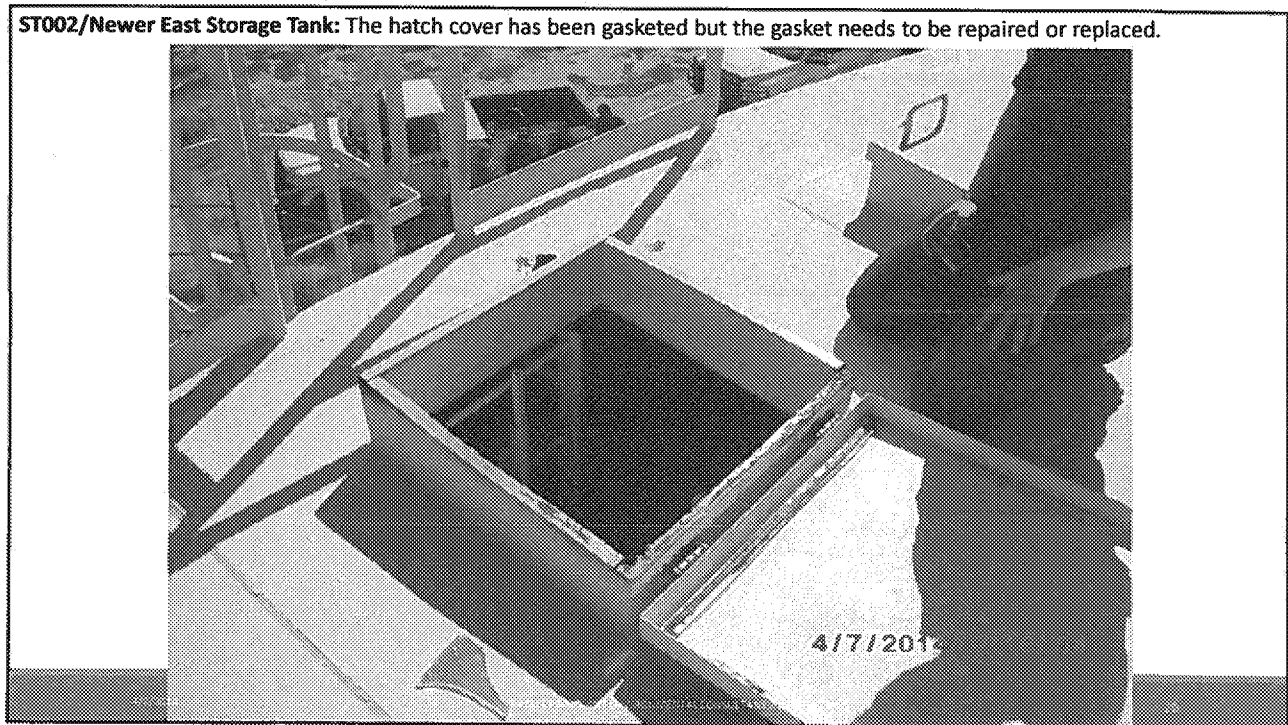




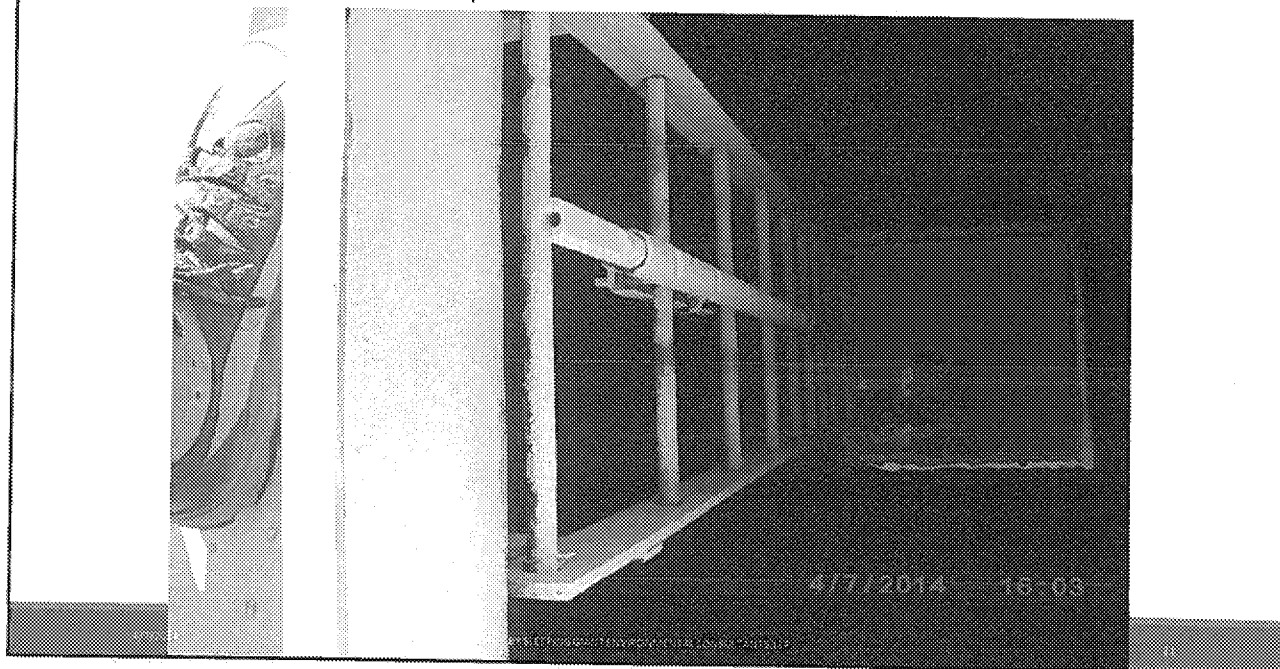
ST002/Newer East Storage Tank: The vent and hatch are properly designed. The vent is screened.



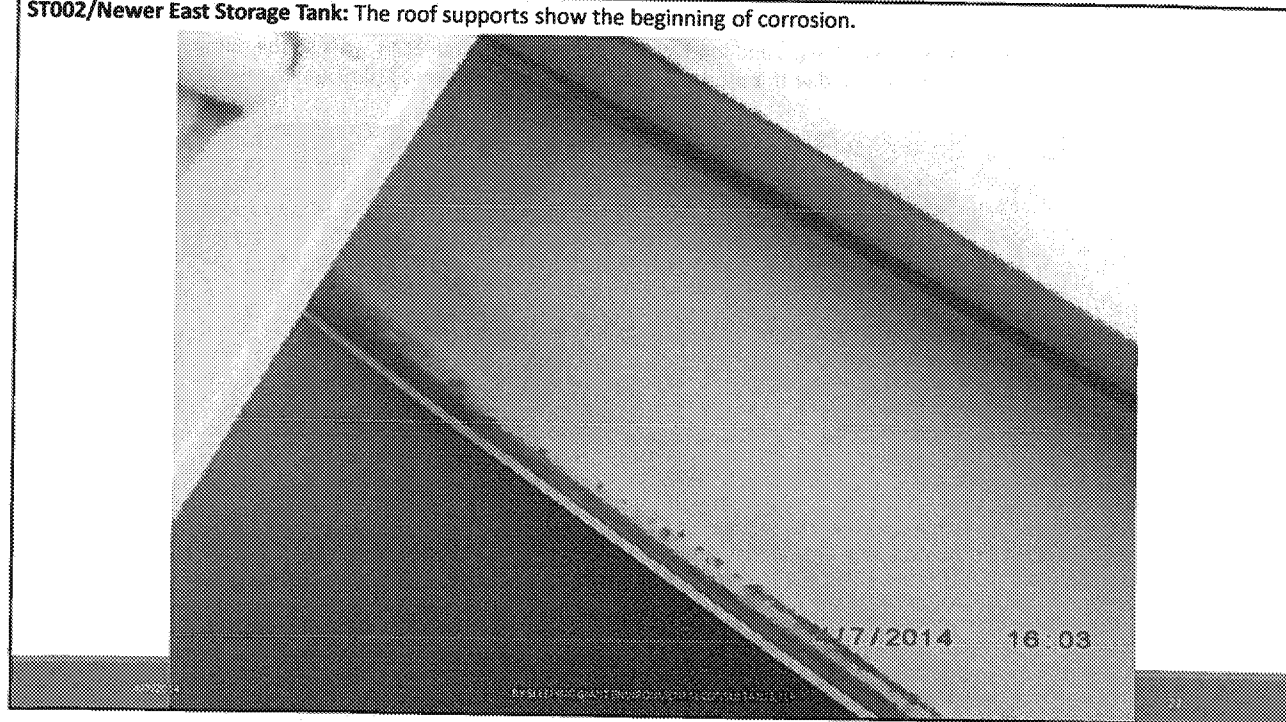
ST002/Newer East Storage Tank: The hatch cover has been gasketed but the gasket needs to be repaired or replaced.



ST002/Newer East Storage Tank: The interior of the tank is starting to show some corrosion. It should be inspected by a tank company and, as needed, repaired/touched up.



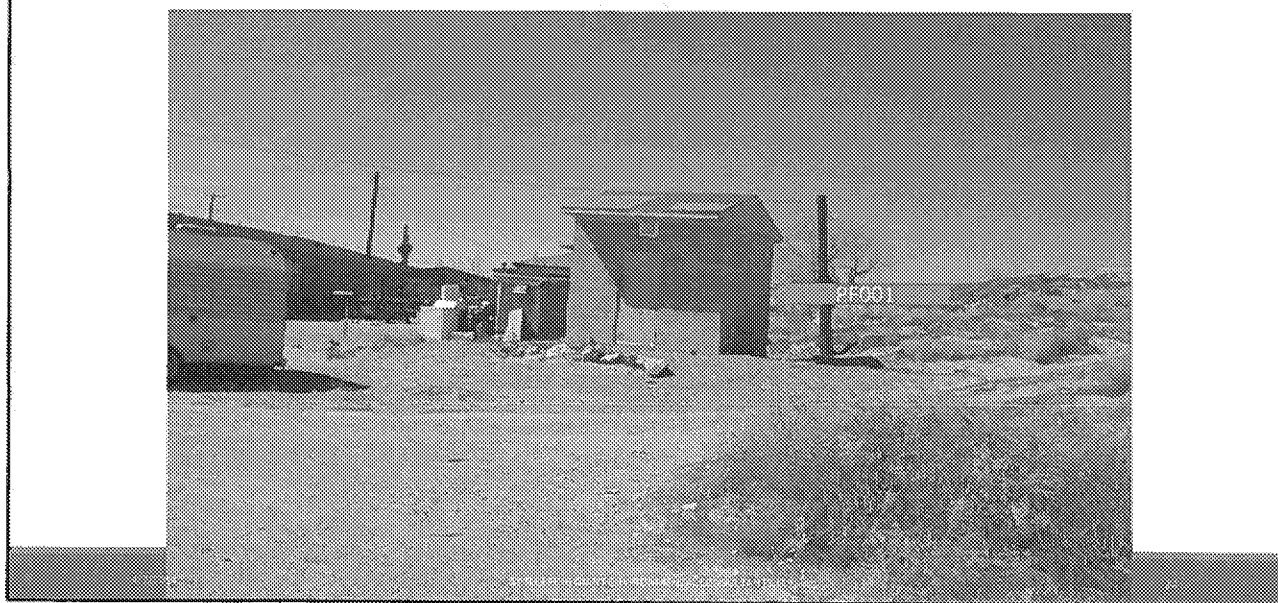
ST002/Newer East Storage Tank: The roof supports show the beginning of corrosion.



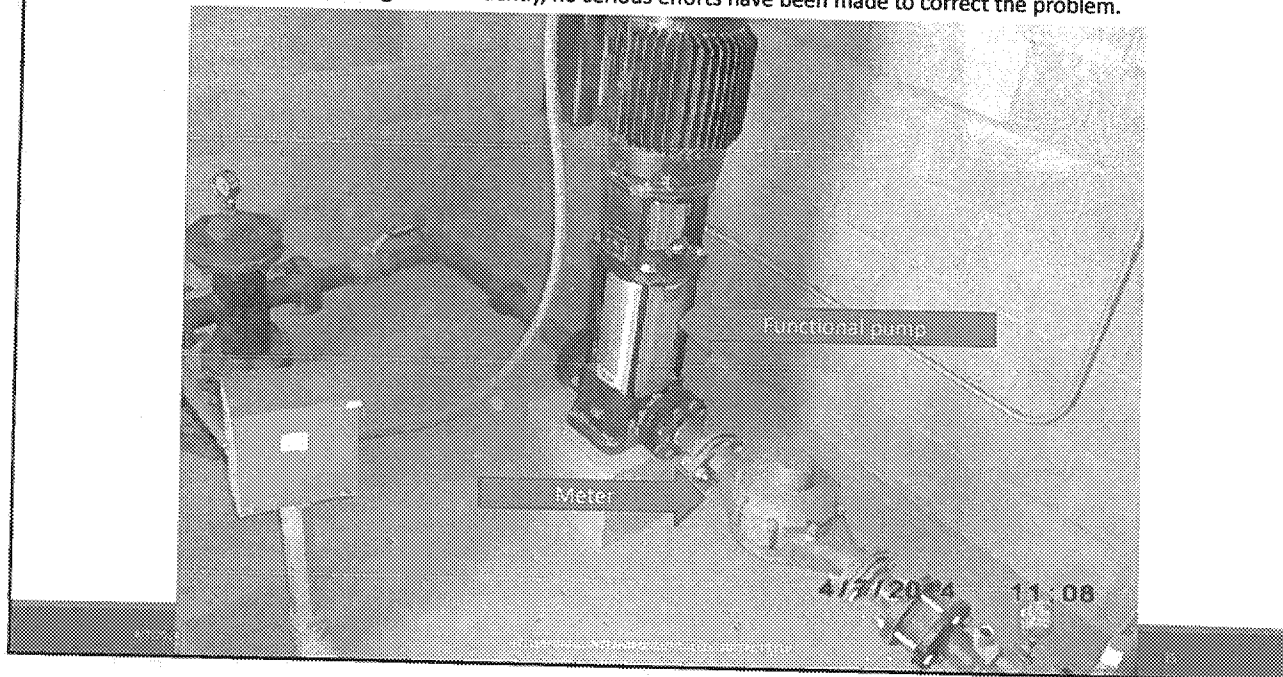
ST002/Newer East Storage Tank: Note the erosion that results from operating the system manually. The overflow is screened.



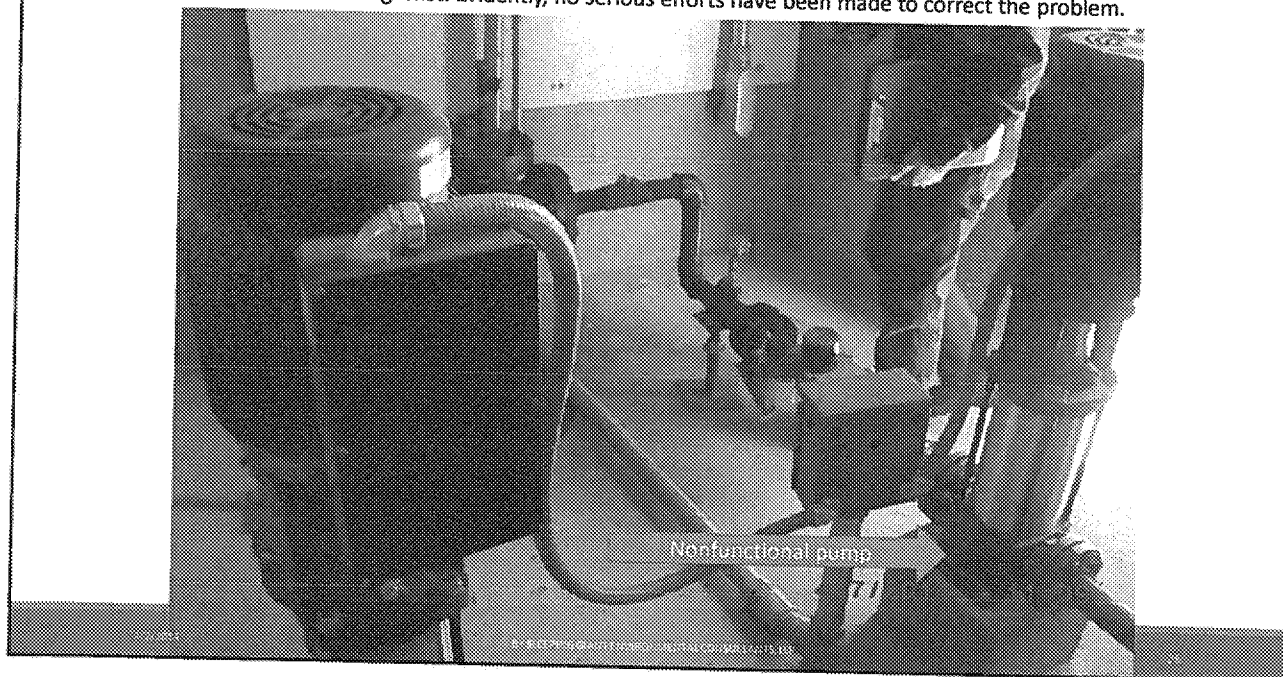
PF001/Pumping Facility to Upper Mesa: This facility pumps water from DS001, through a transmission main and to the upper Mesa where it is stored in ST003 (an 8,000-gallon ground level tank). The automation doesn't work so the pump is operated by a timer. It runs one hour at a time six times each day. If it produces excess water, it overflows ST003 and the water runs off the mesa.



PF001/Pumping Facility to Upper Mesa: The duplex pumping facility has had only one pump that works for years. The other is down, reportedly, because of a bad gasket. Evidently, no serious efforts have been made to correct the problem.

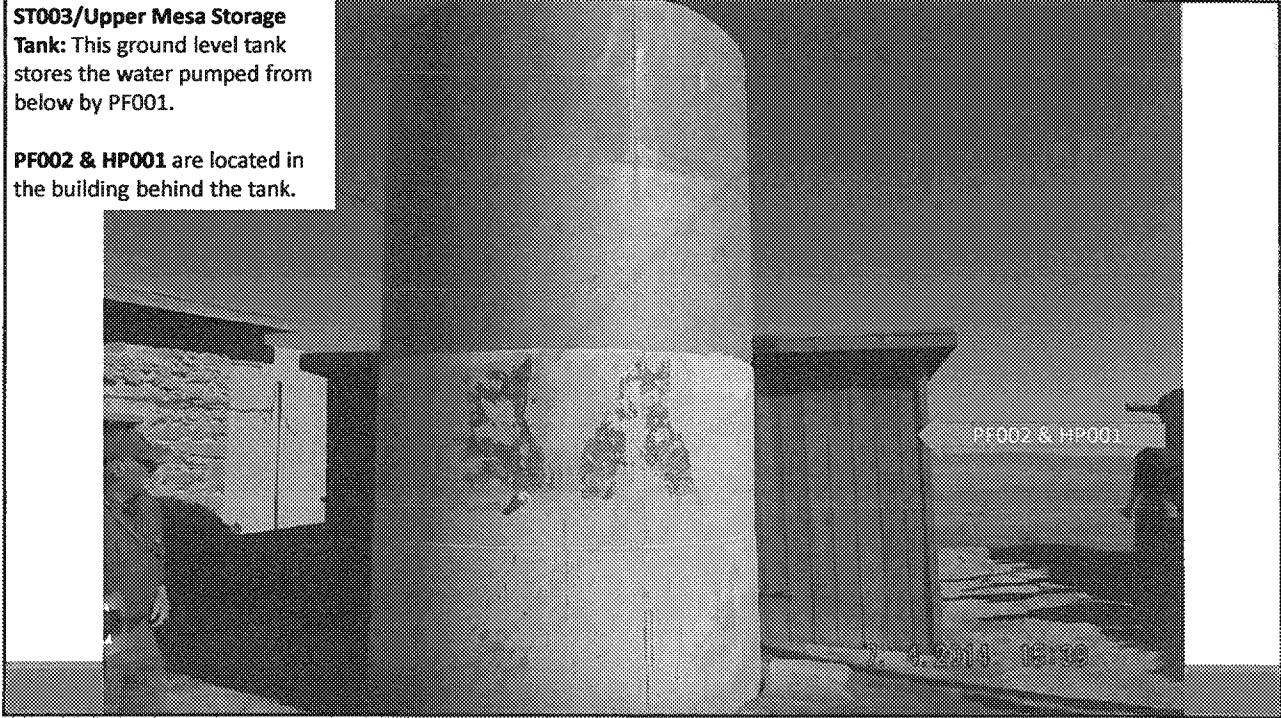


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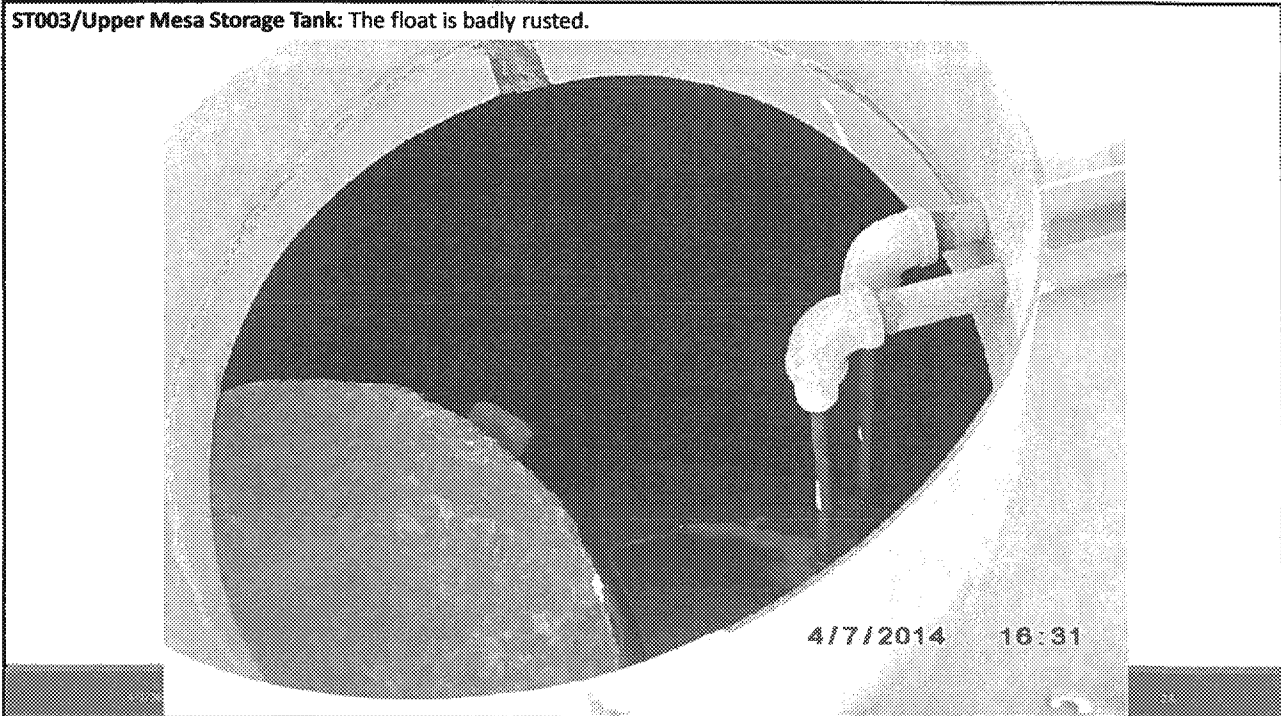


ST003/Upper Mesa Storage Tank: This ground level tank stores the water pumped from below by PF001.

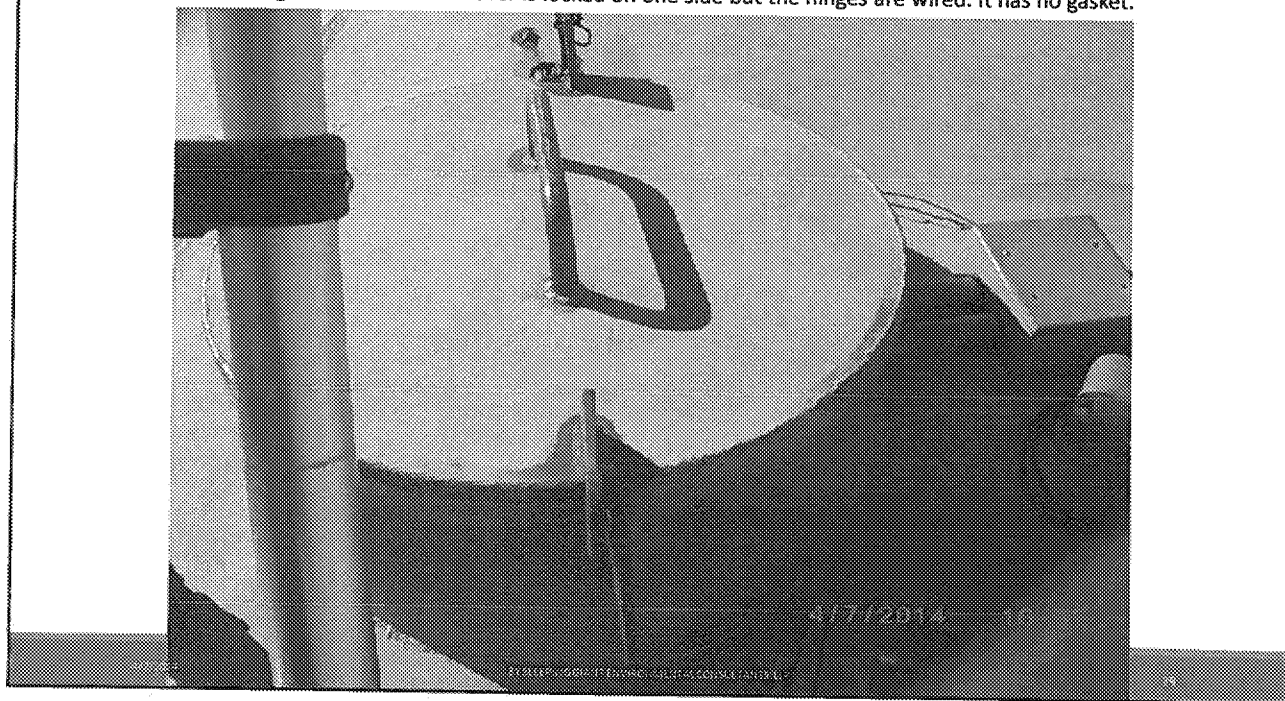
PF002 & HP001 are located in the building behind the tank.



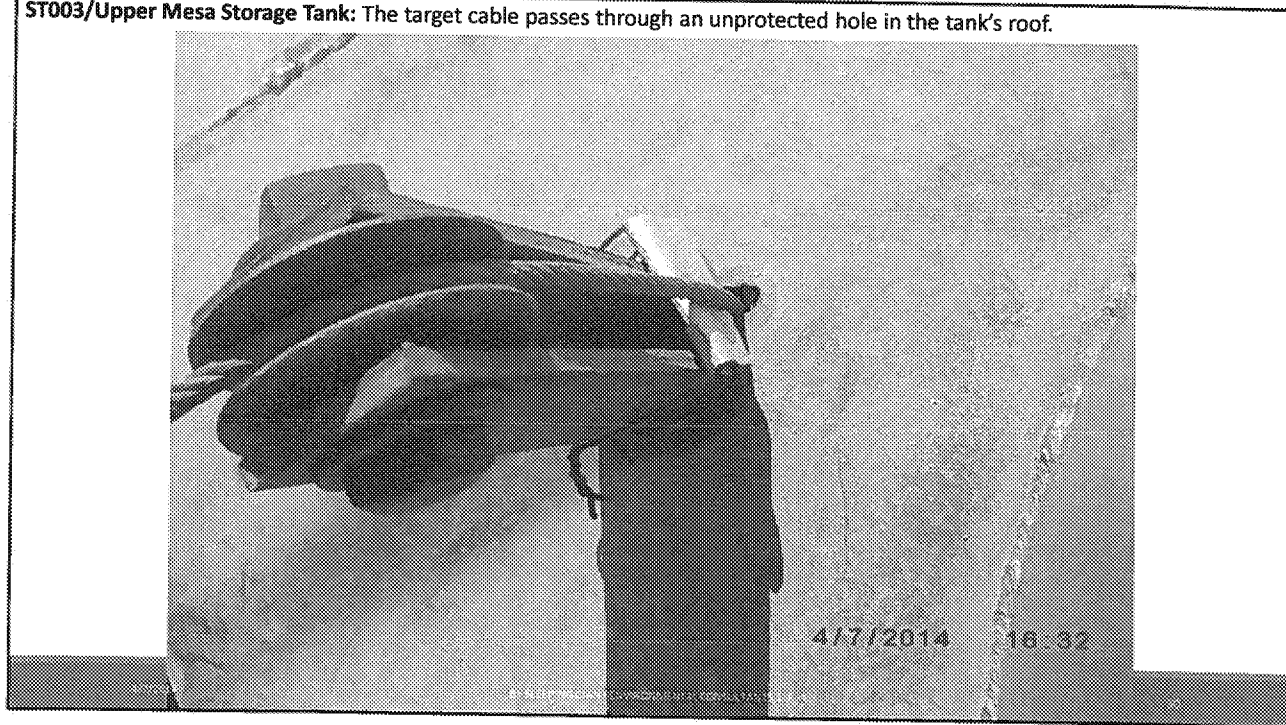
ST003/Upper Mesa Storage Tank: The float is badly rusted.



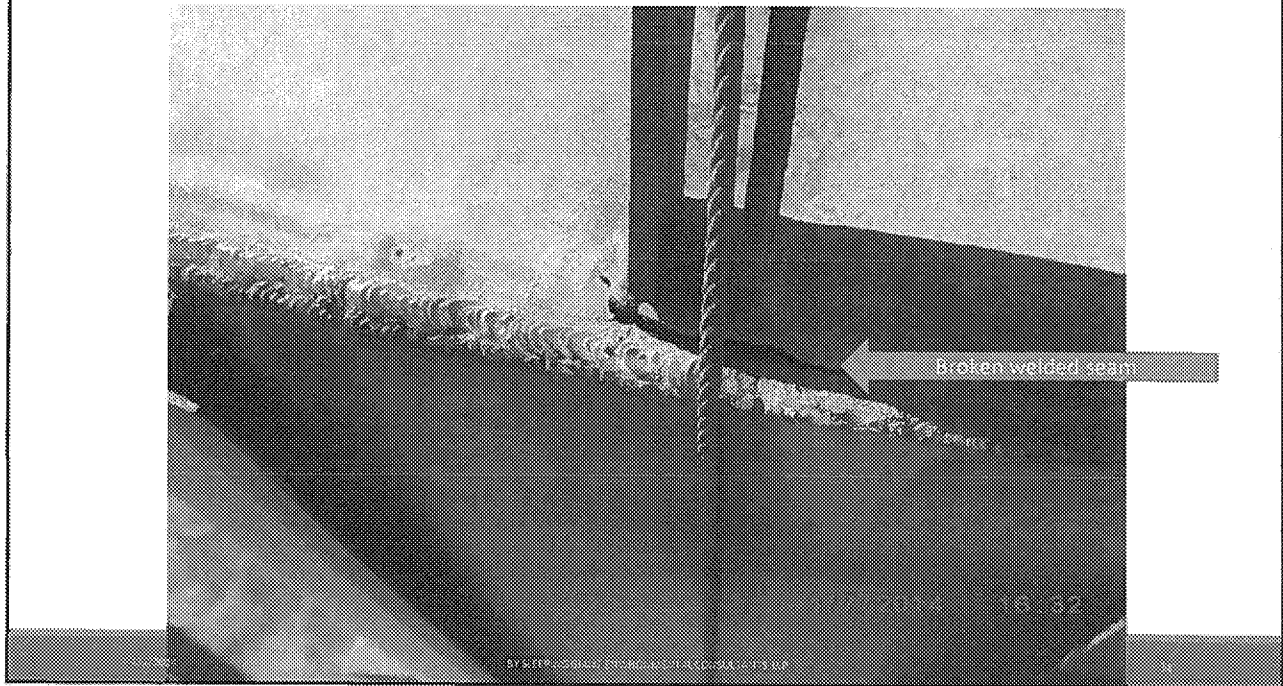
ST003/Upper Mesa Storage Tank: The hatch cover is locked on one side but the hinges are wired. It has no gasket.



ST003/Upper Mesa Storage Tank: The target cable passes through an unprotected hole in the tank's roof.



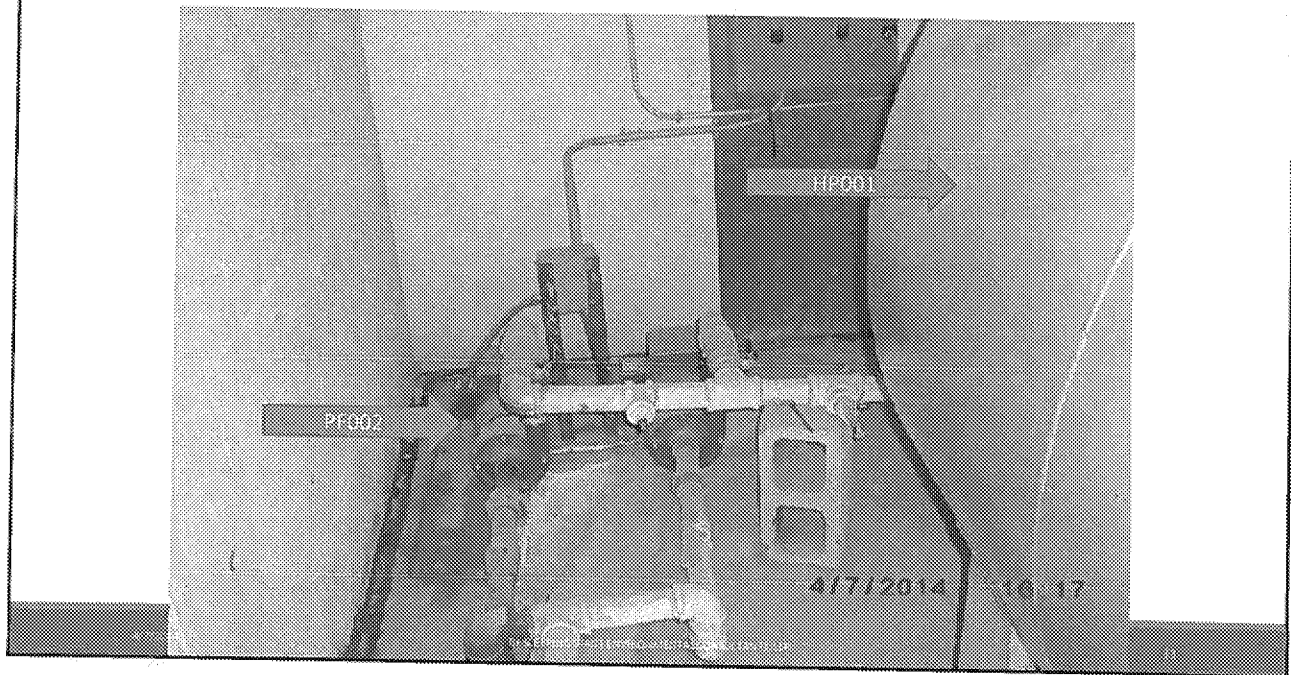
ST003/Upper Mesa Storage Tank: This is an opening caused by corrosion.



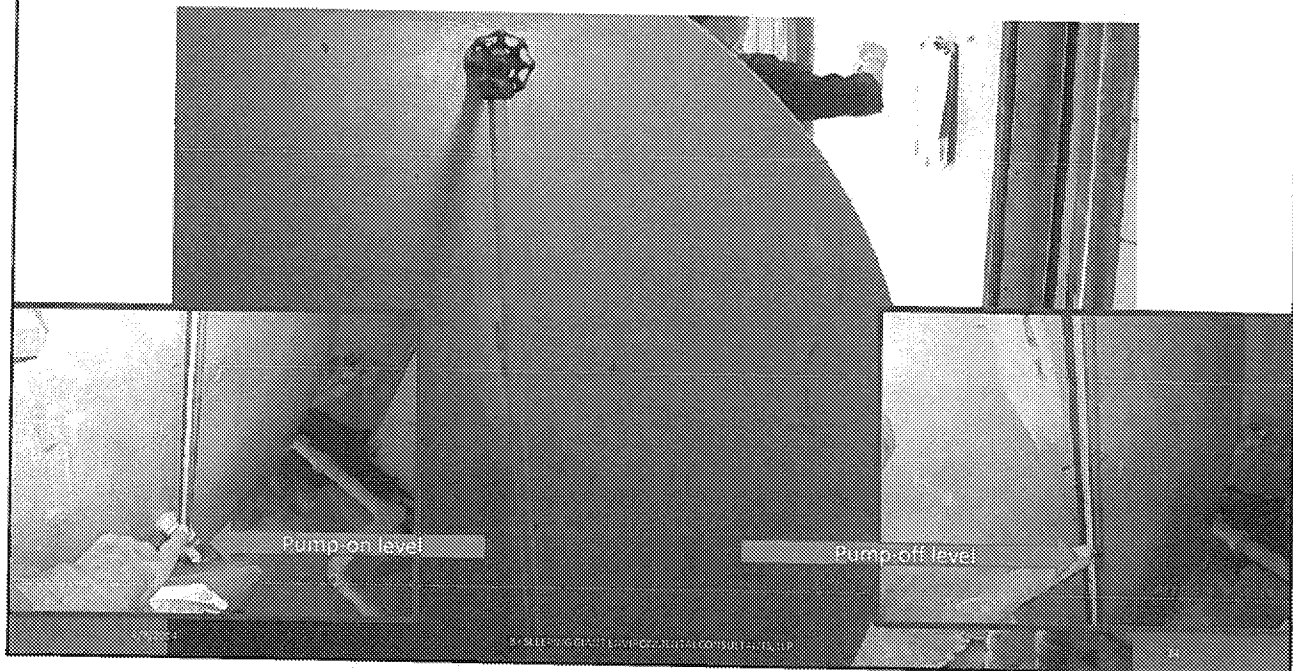
ST003/Upper Mesa Storage Tank: The inlet line leaks due to corrosion.



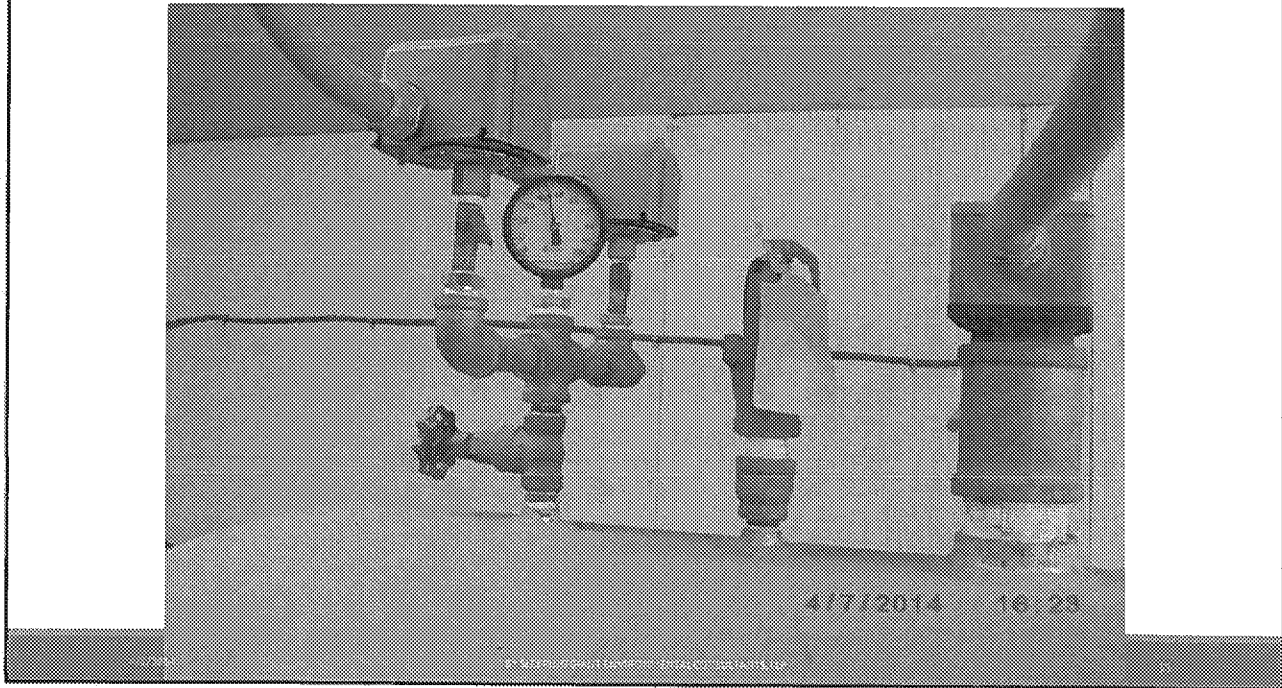
PF002/Upper Mesa Booster Pumping Facility & HP001/Hydropneumatic Tank 1: The duplex pumping facility operates off a pressure switch.



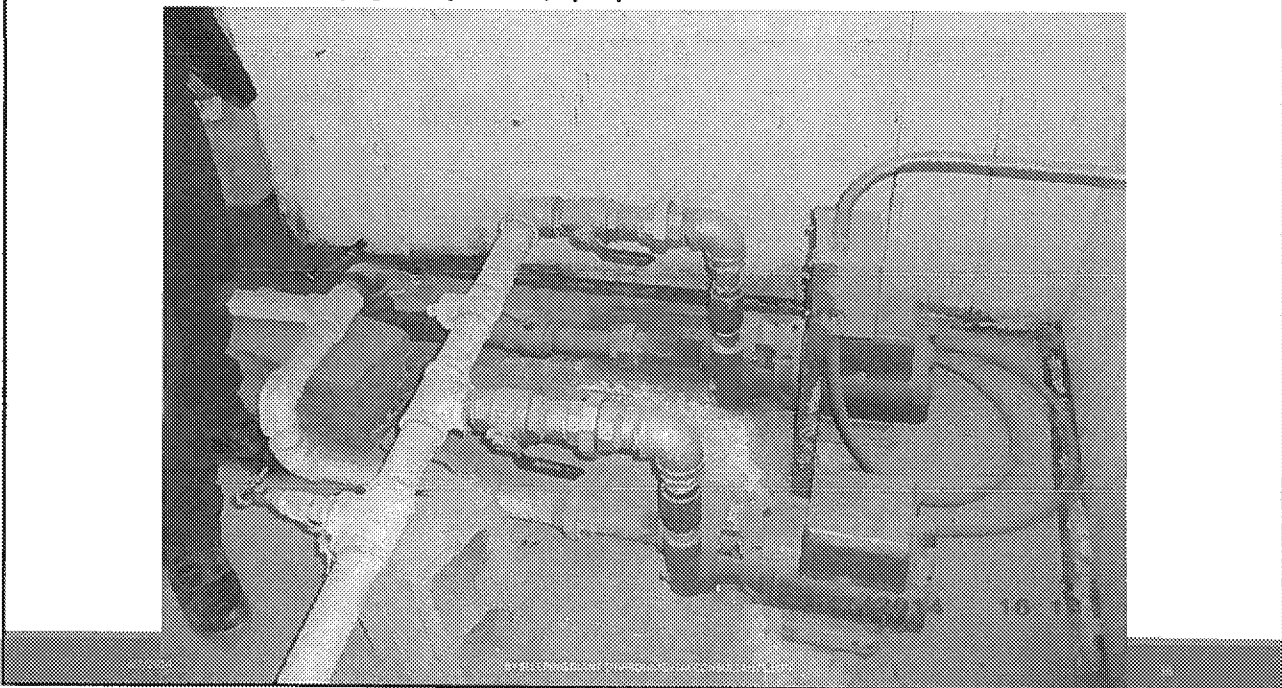
PF002/Upper Mesa Booster Pumping Facility & HP001/Hydropneumatic Tank 1: The air/water interface hydropneumatic tank has a sight gauge.

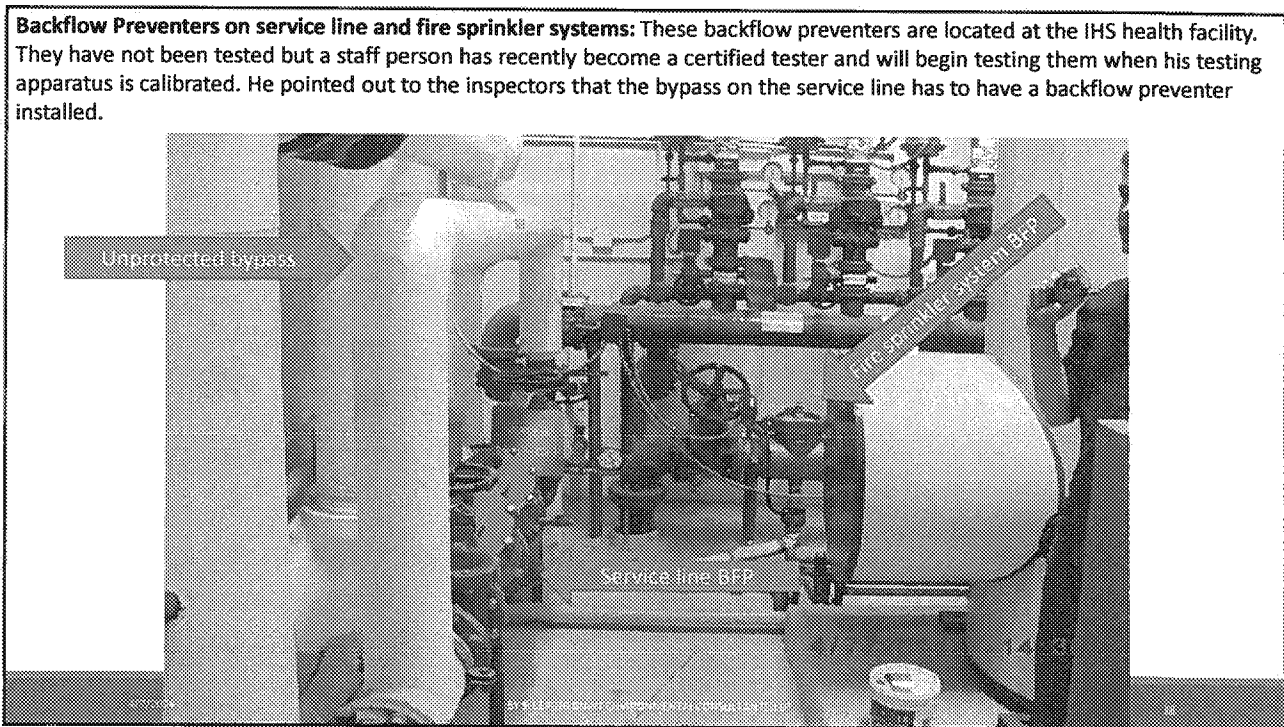
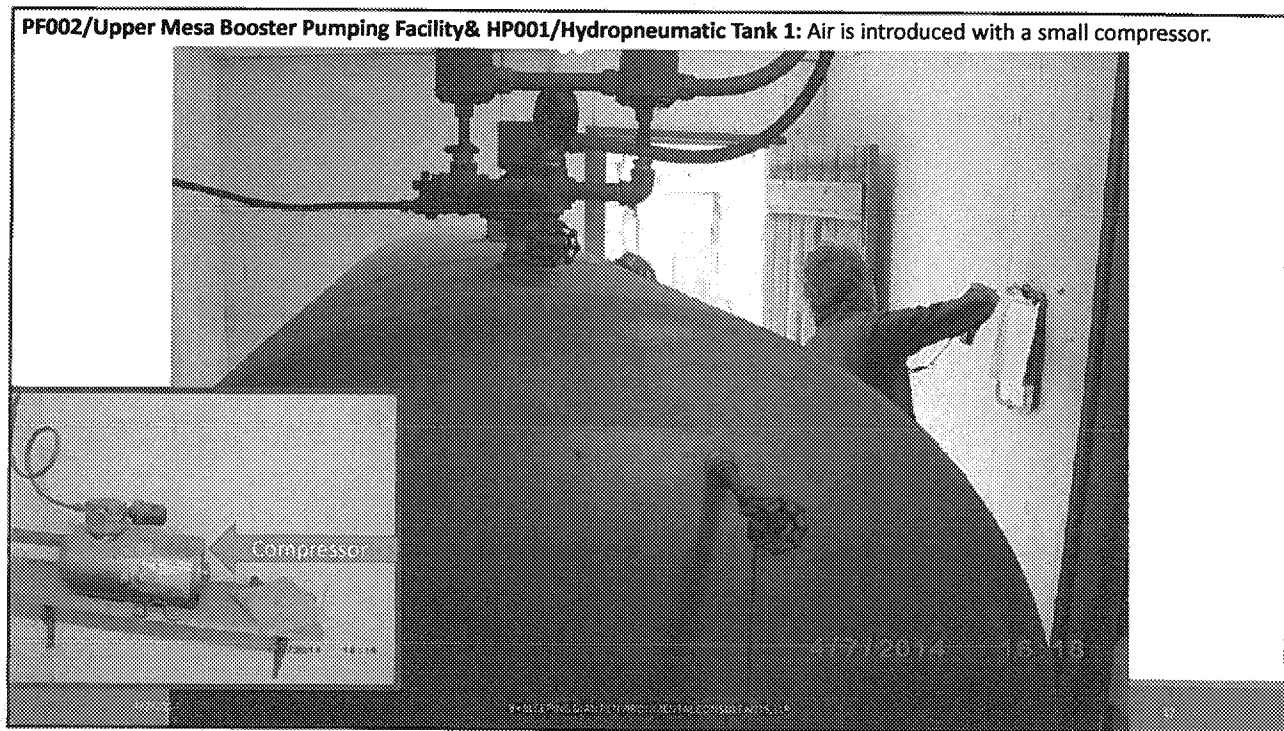


PF002/Upper Mesa Booster Pumping Facility& HP001/Hydropneumatic Tank 1

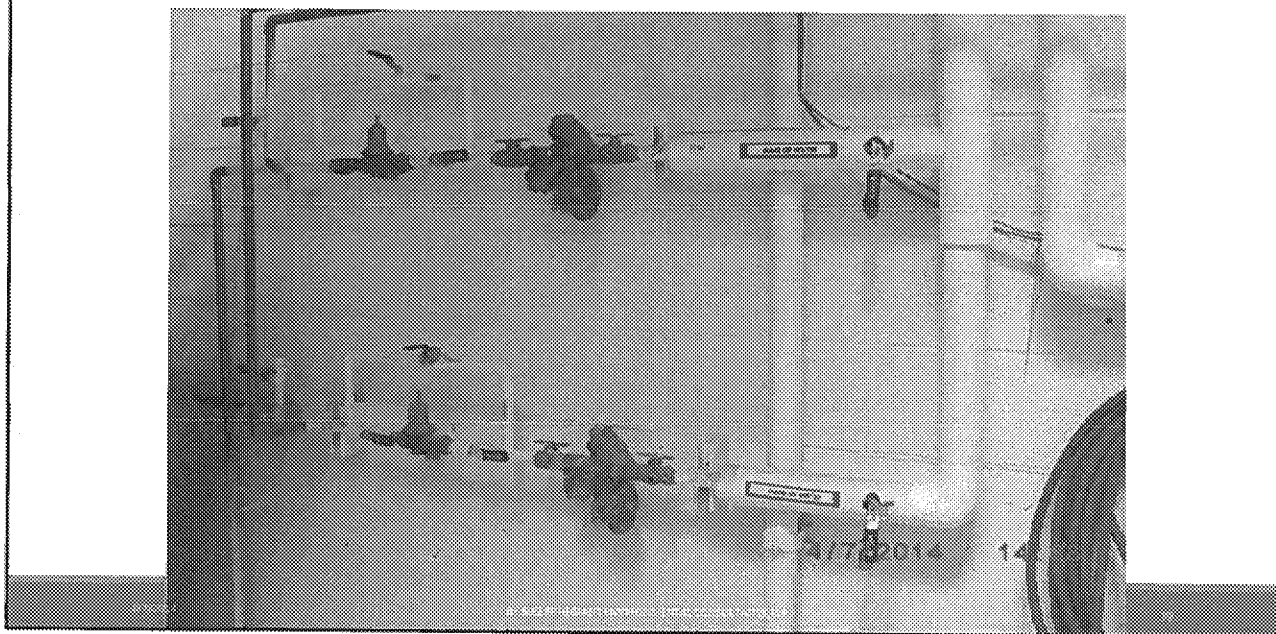


PF002/Upper Mesa Booster Pumping Facility& HP001/Hydropneumatic Tank 1





Backflow Preventers on boiler makeup water lines. The owners of the facilities that have backflow preventers are responsible for having them tested annually and keeping them in good working order. It is the responsibility of the PWS to make sure this is done.



Backflow Preventers fire sprinkler system. One of the IHS's fire sprinkler system backflow preventers.

